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TRANSACTIONS

OF

THE NEW YORK

Academy of Medicine

1896-1901

SEMI-CENTENNIAL CELEBRATION

ANNIVERSARY DISCOURSES
PRESIDENTIAL ADDRESSES
MEMORIAL ADDRESSES
WESLEY M. CARPENTER LECTURES

LIST OF PAPERS READ AT THE STATED MEETINGS OF THE ACADEMY

OFFICERS OF THE ACADEMY AND OF THE SECTIONS

PRINTED FOR THE ACADEMY
1903

BOSTON MEDICAL
JAN 22 1904
LIBRARY.

4095

CATALOGUED
JAN 22 1904
E. H. B.

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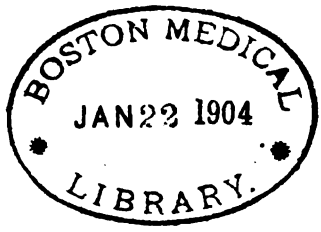

THE CELEBRATION

OF THE

SEMI-CENTENNIAL ANNIVERSARY

OF THE

NEW YORK ACADEMY OF MEDICINE

HELD AT

CARNEGIE MUSIC HALL

JANUARY 29, 1897

PREFACE

THE following pages contain a full account of the semi-centennial celebration of the New York Academy of Medicine, held on January 29, 1897, together with a copy of the original constitution of the Academy and a list of the officers of the Academy from the time of its organization, in 1847, down to January 1, 1897.

The celebration began with exercises in the large auditorium of the Carnegie Music Hall, Fifty-seventh Street and Seventh Avenue, at 8.30 P.M. A brilliant assembly of the Fellows of the Academy and their invited guests filled the hall to overflowing.

After the eloquent address of the President of the United States, the Hon. Grover Cleveland, which closed the formal part of the exercises, a reception was held in the building of the Academy of Medicine, No. 17 West Forty-third Street. Here all were presented to the President of the United States, who graciously delayed his departure to Washington for the purpose of meeting the Fellows of the Academy and their guests.

At a stated meeting of the New York Academy of Medicine, held November 5, 1896, the following recommendation from the Council was read:

"In view of the approach of the semi-centennial of the New York Academy of Medicine, the Council recommends to the Academy that the occasion be celebrated in an appropriate manner, and that the details of this celebration should be left to three committees—one of arrangement, one of invitation, and one of entertainment, to be appointed by the President, of which he shall be a member ex-officio."

Upon motion this recommendation of the Council was accepted.

The President appointed the following committees, in accordance with the resolution:

COMMITTEE ON ARRANGEMENTS.

William M. Polk, M.D., Chairman.

Robert F. Weir, M.D.
Charles McBurney, M.D.
D. B. St. John Roosa, M.D.
William T. Lusk, M.D.
A. Alexander Smith, M.D
Edward G. Janeway, M.D.
Landon Carter Gray, M.D.
Edward D. Fisher, M.D.

COMMITTEE ON INVITATION.

John H. Girdner, M.D., Chairman.

Egbert H. Grandin, M.D.
Clarence C. Rice, M.D.
Charles Inslee Pardee, M.D.
Prince A. Morrow, M.D.

COMMITTEE ON ENTERTAINMENT.

Daniel Lewis, M.D., Chairman.

M. Allen Starr, M.D.
Clement Cleveland, M.D.
Nathan E. Brill, M.D.
H. Holbrook Curtis, M.D.
Arthur M. Jacobus, M.D.
T. Matlack Cheesman, M.D.

ANNOUNCEMENT BY THE COMMITTEE ON ARRANGEMENTS

THE NEW YORK ACADEMY OF MEDICINE.

NEW YORK, December 15, 1896.

At a stated meeting of the Academy of Medicine, held November 5th, it was unanimously resolved to celebrate the semi-centennial of the founding of the Academy.

The Committee of Arrangements begs to announce that public exercises will be held on January 29, 1897, at Carnegie Hall, to be followed later in the evening by a reception at the Academy of Medicine.

The programme will be substantially as follows:

Address by President Cleveland.

Oration by Dr. A. Jacobi.

Addresses by one or more of the founders of the Academy.

Each Fellow of the Academy will be entitled to two reserved seat tickets (good until 8 P.M.), and also to one ticket, admitting two, to the reception at the Academy.

The expenses of the celebration will be about $3,500, and the committee asks from each Fellow of the Academy a subscription of $5 or more.

Tickets will be issued in the order of application; you will therefore kindly fill out the enclosed card, stating whether you intend to be present, and also the amount of your subscription.

It is hoped that all the members of the Academy whether expecting to be present or not, will subscribe liberally, as it is intended to make the occasion a memorable one in the history of the Academy.

WM. M. POLK, M.D.,
Chairman Committee of Arrangements.

EDWARD D. FISHER, M.D.,
Secretary.

INVITATION TO THE CELEBRATION

The President and Council
request the pleasure of your company
at the
Semi-Centennial Celebration
of
The New York Academy of Medicine,
on Friday evening, January the twenty-ninth.

JOSEPH D. BRYANT, M.D.,
President.

REGINALD H. SAYRE, M.D.,
Secretary.

COMMITTEE ON ARRANGEMENTS:

William M. Polk, M.D., Chairman,

Robert F. Weir, M.D.,
William T. Lusk, M.D.,
Charles McBurney, M.D.,
A. Alex. Smith, M.D.,
D. B. St. John Roosa, M.D.,
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Clement Cleveland, M.D.,
Arthur M. Jacobus, M.D.,
Nathan E. Brill, M.D.,
T. Matlack Cheesman, M.D.

EXERCISES AT CARNEGIE HALL

January 29, 1897.

PROGRAMME OF EXERCISES AT CARNEGIE HALL.

INVOCATION,
Right Rev. Bishop Potter, LL.D

ADDRESS,
Joseph D. Bryant, M.D.,
President of the New York Academy of Medicine.

Music.

ADDRESSES,
Samuel S. Purple, M.D., and Lewis A. Sayre, M.D.,
of the Founders of the New York Academy of Medicir

Music.

ORATION,
A. Jacobi, M.D.,
an ex-President of the New York Academy of Medicine

Music.

ADDRESS,
The President of the United States, Hon. Grover Cleveland.

Music.

ADDRESS

BY THE PRESIDENT OF THE ACADEMY

JOSEPH D. BRYANT, M.D.

Ladies and Gentlemen:

As presiding officer of the occasion, it gives me great pleasure, on behalf of the Fellows of the New York Academy of Medicine, to extend to all a cordial welcome to the semi-centennial anniversary of the foundation of the organization. We greet you with a keen sense of appreciation of the honor your presence confers, and venture to express the hope of a continuance of your friendly regard in time to come. And, too, we hasten to acknowledge our profound obligations to those whose beneficent aid and loyal support have reared from comparative insignificance to sturdy manhood a medical body coequal with the other learned professions of the city, in material and scientific possessions.

Your attention is respectfully directed to the expression indicating the medical purposes of the organization, which are, in the language of the constitution of the Academy, "the promotion of the science and art of medicine, including the maintenance of a public library." How well these aims have been observed will be told to you by the orator of the evening, and, therefore, needs no mention at this time. Neither does it require the utterance of pointed or extended statements to indicate the reason for the presence of this distinguished and kindly gathering of the friends of the Academy of Medicine, for the generous regard exhibited by you at this time is a self-evident expression of the natural delight experienced by all

good people in the realization of the happy outcome of commendable endeavor under all circumstances.

The Fellows of the New York Academy of Medicine and their friends signalize with exceeding gladness to-night their appreciation of the wise conception of fifty years ago, and of the magnificent issue—an issue the product of continued effort, stimulated by public pride and professional fidelity. The attainment by the organization of its grand home and scientific belongings can be regarded in no other light than as an earnest of its rapidly advancing importance, based on an awakened professional *esprit du corps* and a higher station in public confidence and esteem. The cohesive efforts of members of our vocation, directed to the establishment and maintenance of tangible evidences of progress and enlightenment that serve to beautify and contribute to the importance of the commonwealth of which they are a portion, engender a healthy and extended consideration for our profession on the part of those whose civic pride and patriotism constitute them as public benefactors.

It is said, sometimes, that many of our calling regard their duty to society as completed when they shall have ministered to the maladies of those *only* whose good fortune enables them to solicit the attention. Certainly, there is no class of citizens that can add more to the stability and moral excellence of a body politic than can those whose professional duty it is to understand and remedy the ill effects of the violations of law and order on the physical and mental vigor of its people; and, when it is recalled that the medical profession of this city alone ministers annually, in the hospitals and dispensaries, to the physical misfortunes of more than half a million of her needy residents, without the expectation of pecuniary recompense or other reward than that which attends well-doing and experience, then, indeed, it can be said with

all modesty of the medical profession, that it contributes a royal part to the health and comfort of the physically oppressed of the community. Nor is the zeal in the labor lessened by the knowledge of the fact that the possessors of plenty often so masquerade in the manner and habiliment of poverty as to secure by illicit method the advantage of charity's price.

The rewards of this labor are potent and far-reaching. The usefulness of the distressed is extended; their self-respect is increased, and gratitude is established in hearts where before it had but a fickle tenure; and thus is begotten a higher sense of accountability to the mandates of good citizenship, and a firmer grasp on the minds of the public of the benefits of self-government. Nor is this all that the medical profession is ready and glad to do. In every question and emergency of a sanitary nature that relates to the corporeal and commercial welfare of the people, the profession gives unsparingly and with earnest desire its best physical efforts and wisest mental conceptions. Striking examples of this course of action on the part of the profession, as represented by Fellows of the New York Academy of Medicine, are witnessed in connection with Quarantine, the Health Department of this city, the Croton water-shed, and other instances; all being matters of such recent history as to require but a mention now to recall, not only those stirring occasions, but also the character, the value, and the outcome of their patient and untiring efforts.

These evidences of professional public spirit were welcome and dutiful offerings, expressive of the fact that physicians, like all other citizens, hesitate at no sacrifice in the interest of the public good. Although the comparative paucity of the substantial rewards of their calling renders impossible the giving of munificent pecuniary contributions, still, their special knowledge, bodily comfort,

and personal safety are bestowed with a freedom that outweighs in the scale of human experience the giving of the grosser gains of unprofessional endeavor.

However this may be, there yet remains the fact that physicians, like other citizens, share in the favors of enlightened control, and, therefore, like them, owe an unswerving allegiance to the principles that contemplate the greatest good to the greatest number, as attained through every path of human exertion. Therefore, to those of generous heart and benevolent purpose we say, that which we have shall be joined with yours, together with a prayer that both shall augment the wisdom and strength of the needy in every walk of life.

Fifty years ago 184 prominent members of the medical profession of this city founded the New York Academy of Medicine. Of this number, eight are yet in the ranks of the living, two of whom will honor this occasion —as all have honored the profession—with words of wise significance.

ADDRESS OF SAMUEL S. PURPLE, M.D.

Mr. President, Friends, and Fellows of the New York Academy of Medicine:

Occasions like the present naturally call up remembrances of the past; these, in detail, I will leave for those who follow me, and will confine my remarks briefly to the spirit, scope, and needs of this institution.

The inspirations of the midnight hour of November 18, 1846, when the cause of the widows and orphans of medical men pleaded not in vain, will ever be remembered as the initial point of this institution. The spirit of that benevolent occasion, fostered and encouraged by the good and true men of the medical profession there assembled,

culminated on January 13, 1847, in the adoption of the constitution and by-laws of the New York Academy of Medicine, which in spirit and power have for the past fifty years fulfilled nobly the purpose for which they were created. They still remain a bulwark for the future guide and protection of this institution.

The motives which moved the founders of this Academy in their work were the creation of an institution which should be a barrier between quackery and medical integrity—the establishment of a stringent motive for ethical observance—a desire to stand well among one's fellows, and a determined step toward professional harmony and sentiment in the suppression of pretension and the support of purity of medical character. May these motives be ever the same in this Academy, their course ever onward, and in the language of another, may this institution ever exist a shelter for the good, a warning and terror to the vicious, a stimulus to and a reward for high and holy action, and a defender of our one faith and common altar.

But there were other motives that moved the founders of this Academy, and which have been constantly kept in view; these are embraced in the cultivation of the science of medicine, the elevation of the standard of medical education, the promotion of public health, the procurement of a building to be devoted to the Academy, one in which all the regular members of the profession could meet on common ground. These objects have, in the main, been realized. But there was still another, which was early entertained by the founders, but which did not take on formal development until 1876, and this was the establishment of a great medical library, free to all, one that would fully meet the present and future wants of the medical profession in this great city. It does not, perhaps, become me to enter even upon a general description

of the methods by which these results have, in the main, been accomplished. Suffice it to say that the New York Academy of Medicine has now a free library at the service of the profession and the public of 50,000 volumes, a medical library which is only excelled in this country by that of the Surgeon-General's office in Washington, and that is cared for and sustained by the general government. Our library, to adequately fulfil the requirements of the present and the demands of the future, greatly needs the early enlargement of the library fund. The present year offers to the friends of this institution the opportunity to aid in this particular the good work in which it is engaged.

In 1877 the honorable the Legislature of the State of New York, on the application of the founders of this Academy, granted a special charter, conferring certain powers and privileges upon the Academy, in the nature of a trust. By this charter the trust funds are completely protected, and the knowledge of this fact, we hope, will lead our friends to aid in the completion of the library endowment fund. When this is accomplished, the library will be able to meet the wants of its thousands of readers.

The marked interest that the wise, the good, and the wealthy men of our city are manifesting in literary facilities, show that New York is fast becoming the literary centre of America. Who of the many thousands that travel on the elevated railway that winds along the eastern slope of Morningside Park, has failed to observe that grand structure which looms up in the western horizon, which Columbia's noble benefactor is erecting and endowing as a home for her library? Such munificent acts of private benevolence call for the admiration and gratitude of the public, alike to that rendered him who wielded armies for the public good.

Casting my eye over this vast assembly and observing the thousands of ladies that grace this occasion, I am

reminded of the fact that they are our best patrons and our warmest friends. No stronger illustration is needed to confirm the truth of this assertion than is found in the history of this Academy. The special charter of 1877 places all the personal and real estate of the Academy in the hands of its five trustees, in the form of a general permanent trust fund. The amount of this fund at the present time slightly exceeds $300,000; of this amount, three lady friends (*and God bless them*) have contributed more than $100,000. May their good example be followed in the coming half-century by some of those who are here to-night.

But Mr. President, I will close these desultory remarks. In looking back upon the career of this Academy for the past fifty years, its founders, who, it has been said, "builded better than they knew," observe with pleasure and becoming pride that their highest anticipations have been realized. They still recognize the inspirations of that benevolent occasion when the cause of the widow and orphan pleaded not in vain, and they most fervently pray that that God who guided and protected the children of Israel in their passage through the Red Sea will, in his own good time and way, guide and protect this institution in efforts to prepare the best means to relieve the downcast, heal the sick, and to encourage and guide the junior members of the medical profession of this great city to good work and good deeds.

Mr. President, I thank you for the privileges of this occasion.

ADDRESS OF LEWIS A. SAYRE, M.D.

Mr. President, Fellows of the Academy, Ladies and Gentlemen:

I remember very well the evening when the idea of forming the Academy of Medicine was first suggested.

It was after the annual dinner of the Society for the Relief of the Widows and Orphans of Medical Men, organized by the late Dr. Edward Delafield, and which, up to that time, had always held its annual dinners at the Astor House.

This occasion afforded the only opportunity the profession had for social intercourse. It is true that there were various small medical clubs in different parts of the city at that time, but their members never met at a common gathering, except at this yearly banquet, when the large dining-room and spacious parlors of the Astor House offered a delightful opportunity for professional discussions after the dinner was over. On this particular occasion we did not meet at the Astor House, as usual, but at Peteler's, a fashionable restaurant on Broadway, near Prince Street. During the course of the evening, the subject of forming a new society was discussed, which should have a building of its own, in which the various departments of the profession could have a permanent home, and in which could be collected a library which should be worthy of the profession, and an honor as well as an ornament to the city. The County Medical Society was, at that time, the only organization that could grant the legal power to practise medicine in this city; it had, however, fallen into disrepute through having failed in the discharge of its official duties, and in maintaining the honor and dignity of the profession.

It was therefore thought best by many of its mem-

bers to organize a new society, which should be governed by a code of ethics, similar to that subsequently adopted by the American Medical Association, at its organization in Philadelphia.

We elected for our first president Dr. John Stearns, on account of his great ability as a presiding officer, his agreeable, affable manners, his sterling integrity, and high sense of professional honor.

This wise choice of a president did much to raise the Academy in the public estimation, and put it on a proper basis for future usefulness.

One of the first acts of the Academy was to petition the Legislature to establish a Board of Commissioners of Health, to look after the sanitary condition of the city; this board to consist of scientific physicians of experience, and practical sanitary engineers, who were to be appointed irrespective of politics, and to be given almost unlimited control of everything pertaining to the public health.

The wisdom of this action is very apparent at the present time, for, on referring to our table of vital statistics, we find that the death-rate of the city of New York compares most favorably with that of any other city, either in this country or in Europe.

As the good sanitary condition of the city has a direct influence on its commerce, we at once see the immense importance of the medical profession to the city's welfare. When pestilence or epidemics prevail, trade and commerce are immediately suspended, and millions on millions of money lost. Then comes the scientific physician to the rescue, with the knowledge which he has acquired in his bacteriological laboratory and his practical sanitary experience; the city is saved and commerce resumes its sway.

After fifty years of steady growth in membership, in social influence, and in scientific advancement, the Acad-

emy stands to-day an efficient bulwark and protection to the public health, not alone of this city and State, but of the whole country.

A committee of twenty-one of its most distinguished members has for two years recommended to Congress legislation which, if adopted, would save thousands of lives annually, and eventually stamp out tuberculosis and certain other infectious diseases from our midst. While the committee has not yet succeeded in securing a National Board of Health, it feels certain that this reform cannot be delayed much longer, and I take this opportunity, on behalf of the committee, and of the Academy itself, to thank the President of the United States, who honors us with his presence to-night, for the advice and support he gave our committee at all times, in its efforts to induce Congress to adopt its suggestions.

The President then introduced the orator of the occasion, A. Jacobi, M.D., who delivered the following oration:

THE SEMI-CENTENNIAL OF THE NEW YORK ACADEMY OF MEDICINE.

Mr. President!

Mr. President and Fellows of the New York Academy of Medicine, Ladies and Gentlemen: One century has expanded this nation of three millions into its present population of seventy. Its democratic constitution attracted Europeans weary of class differences, prejudices, and sufferings. Liberty and equality, inscribed on its flag, opened opportunities to intelligence and diligence, roused legitimate rivalry, and developed inventive genius and independence of character. While inventive genius, coupled with industry, led to prosperity, independence of character found or fought its way out of political errors or

actual calamities, sometimes without, other times with the guidance of clear-headed, unselfish, determined, and consistent leaders. But a young nation in its infancy has, properly speaking, no preconceived designs. It is like a product of nature, unfolding spontaneously. In evolving its organic life it rises to self-consciousness, and possibly to the development of an ideal.

It was on the same democratic basis that one-half of a century ago the New York Academy of Medicine was founded. But it differed from the national commonwealth in this, that it required no time to exhibit concerted aims or definite plans. Nor was it without an ideal from its beginning. It was well understood that our Academy was to differ materially from what is called an academy of medicine in Europe. A European academy is always a government institution, in some way or other supported by centralized national means. Its members comprise the intellectual and sometimes the social heads of the profession only. Young faces are but seldom seen among its fellows. Membership is, as a rule, obtained after a long life of successful scientific pursuits only. Their labors and efforts are not intended for practical aims or objects, but they become beneficent by the action of that logical force which ordains that there is no scientific result, no truth ever so abstruse, but will finally terminate in some tangible application. Though all this be true, the limitation and exclusiveness of membership results in a sort of aristocratic estrangement from the masses of the profession, and still more from the community at large.

The New York Academy of Medicine has a broader basis. The high and lowly, the old and young, the mature and the youthfully ambitious, though they represented the most different and various types, combined for the same purposes.

According to a circular issued years ago, in the pos-

session of many, the Academy is not connected with any school or college. It is self-supporting, and carried on in the interest of the whole profession. There are no fees or emoluments of a private or individual nature. It is a democratic community, with equal duties and rights. It is not subsidized by the State or municipal corporation. Its aims are the elevation of the profession to a higher scientific standard for increased public usefulness. We claim that these aims concern the public as much as they do the profession. Increased scientific attainments on the part of the medical men of the country secure to the people great advantages and more effective service. Here it is that the interests of the nation and of the profession meet. Ay, I shall prove to you that the immediate interests of the whole community have for many years been uppermost in the creed and in the deeds of the Academy. Indeed, there is abundance of evidence to demonstrate that the Academy deserves the general interest and sympathy exhibited to-night by so many distinguished, not only in society but in all the professions, and in literature and science; ay, by the Chief Magistrate of the nation.

The history of the New York Academy of Medicine as a scientific institution is contemporaneous with that of modern medicine as created by Virchow and the German school which rapidly rose and broadened into scientific cosmopolitanism. In this wonderful evolution the Academy has freely participated. It was fully prepared for it by its ancestry. That ancestry was Anglo-Saxon medicine, which, since Sydenham, never swerved for any length of time nor suffered from philosophical theories built on clouds, nor from the chaos of mysticism which reigned supreme in a part of the European continent during the first half of this century. The American medical profession, like its Anglo-Saxon ancestry, was penetrated by the spirit of intelligent scrutiny. The best of the one

hundred and eighty-four founders of the Academy developed it, the plainer men shared it. The fifty years of its existence have furnished wonderful proof of the facile adaptation of Anglo-Saxon clinical empiricism to the equally solid results of modern pathology, histology, and bacteriology.

The very first paper printed in 1847 for the Academy was a historical sketch, by Pliny Earle, of the institutions for the insane in the United States of America. Much later, in 1861, Parigot read his paper on moral insanity in relation to criminal acts. The interest in that all-important subject, so replete with dangers both to the actual or alleged criminal and to human society, has never died out in the Academy, until it could sustain a few years ago the movement to transfer our insane to State care, with which the name of Louisa Lee Schuyler will forever be indelibly connected. The report of a committee upon the comparative value of milk formed from the slops of distilleries and other food, in 1848, was followed by one on solidified milk, in 1854, and another one on city milk, in 1859. William H. Van Buren's and Gurdon Buck's papers on tracheotomy in croup, and Van Buren's on hip-joint amputation, were read in 1850. Valentine Mott's (the first to operate for aneurism of the innominata) remarks on the importance of anæsthesia from chloroform date from 1848; his case of aneurism and ligature of the left subclavian artery from 1851. Not long after, C. E. Isaacs communicated his original work on the structure and physiology of the kidney, 1856; and John C. Dalton his memorable researches on the anatomy of the placenta in 1858.

Some time previously the accessibility of the larynx and bronchial tubes was first proven in the Academy by Horace Green; that was more than forty years ago. The cholera epidemics of previous times were the subjects of

papers, thoroughly enjoyable to-day, by John W. Francis. The diphtheria discussion of January, 1860, was an incentive to observation and study all over the States and beyond. Gurdon Buck invented his and our present method of treating femoral fractures, in 1861. J. Marion Sims, whose statue adorns Bryant Park, benefited mankind by his silver sutures, by improved and by new operations, and by many papers and discussions. John Watson wrote for the Academy his learned history of medical men in ancient times in 1856. On the floor of the Academy J. T. Leaming, after P. Camman had facilitated diagnosis by the double stethoscope, still in use, taught his brilliant theories of the functions of the pleura and of the respiratory murmurs.

Not long after (1863), Louis Elsberg instructed the profession in the topical medication of the larynx and neighboring organs under sight. John C. Dalton spoke on "Vivisection, What it Is, and What it Has Accomplished," in 1866; and the Academy published Robert T. Edes's prize essay, 1869, on the physiology and pathology of the sympathetic or ganglionic nervous system; also a report of William C. Roberts on the causes of death and disease in the metropolis, 1868. There were also notable discussions on cholera, on chronic metritis, on ventilation, and on sanitary police in 1866, and the paper in 1867, by A. C. Post, on the curative effects of blood-letting. There were contributions by Willard Parker, Alonzo Clark, Austin Flint, and a host of others, whose names will not be forgotten, though they be not mentioned here. For it cannot be my intention to review all the Academy has accomplished during its lifetime. What I have told you refers to those whose faces and voices are known to our memories only. Indeed, while I was glancing over the sacred list of the one hundred and eighty-four founders, my eye was arrested by at least forty names of men who, by original

investigations and contributions, have deserved well of the science and art of medicine.

As to those still living, a single allusion must suffice. One of the later great results of academic work was the memorable discussion on intubation of the larynx in croup, on June 2, 1887. It followed the discoverer's long-continued labors and his paper on "Intubation versus Tracheotomy," and carried the renown and influence of American ingenuity all over the globe. Let me also mention the debates of last year on the diphtheria antitoxin, which have contributed much to the study and dissemination of the employment of that beneficent antidote.

Such are the method and line of work by which this American institution has exhibited its power, enlarged its sphere of influence, and rivalled the countries of old Europe. Such is the kind of competition that is bid a hearty welcome all over the world. That is the only kind of interference with and combination against Europe which, without collision, but with co-operation, is worthy of the great American people. There is your reciprocity without a treaty, indeed, not only reciprocity of mutual giving and taking, but the proof of intellectual solidarity and fraternity of civilized mankind.

The distinctive feature, however, of the New York Academy of Medicine, as a peculiarly American institution, is not its merely scientific work. This it has in common with similar organizations in monarchical countries. Its characteristic superiority consists in this, that it is composed of citizens. The American is or ought to be the "*zoön politikon*," the political creature of Aristotle, a co-operative cell in the organism of society. From that point of view let me glance over the fields on which you will find the members of this association in full activity; let me indicate what they are doing for you individually as practitioners; for you as a community as sanitarians,

to the utter neglect of self-interest; let me also show the relation of the Academy to its own members and to other scientific bodies. Finally, let me consider what it and you combined may be capable of achieving for the future of medicine and of mankind.

As practitioners, the members of the profession, academicians and others, have amply satisfied the reasonable expectations of the sick in the community. In former times almost every man, the most illustrious surgeon of the day not excepted, was a general practitioner. Specialists were not so numerous as they are to-day; indeed, there existed but few. These were men of ripe, general experience, who would confine their work to a special organ or line of practice. When medical science broadened out and its progress depended on thoroughly specialistic study and research, the big old tree divided up into branches and branchlets; and in the practice of medicine the number of specialists, both mature and immature, justifiable or otherwise, increased almost incredibly. Time will be demanded to correct the mistakes and incongruities of overgrowth. Meanwhile, I am glad to be able to assure you that general practitioners still exist, and also that many specialists, known or unknown, as the case may be, have not ceased to be doctors. You know them well and intimately. Your doctor is summoned night or day, by your servant, or your telegram, or telephone. You order, there he is. He is expected to aid you with therapeutical and other means—*therapos* means servant; and to cure—the very word means care. If ever there is a class of persons who deserve to be decorated with the device "*Ich dien*," "I serve," it is your doctor. He must not know, he does not know, the difference between night and day. With doleful jealousy he might hear of the efforts of philosophers, philanthropists, statesmen, and even of politicians, in favor of an eight-hour or ten-hour day. He is

expected and willing to work indefinitely to lighten somebody's burden, like sun, or moon, or stars, that know of no rest. If anybody, your doctor is not the lily in the field that does not spin.

The same doctor goes a few streets to a hospital or to a dispensary. There he serves the poor, or the alleged poor. One of the hundreds of necessary and unnecessary institutions of the kind with which different grades of exigency, or philanthropy, or officiousness, or greed, or the wants of a teaching institution, have supplied the city claims his service. He meets the poor and also those who don the clothing of their servants to appear poor, sometimes those who leave their carriage and footman around the corner. He must not complain. He has heard of the woman in the Gospel who, before she applied to the Master Healer, is said to have "suffered many things from the physicians"; and concludes that the time has now come when the physician is to suffer from the many. Thus he aids, though ever so unwillingly, in robbing himself and his professional brethren, and in demoralizing and pauperizing a goodly part of the community. That is another unwelcome outgrowth of modern science and philanthropy, to correct which time and thought, and the cooperation of the profession and the public, are urgently demanded.

Thus he works on and on. It is but a few weeks ago that an old practitioner told me of his life. It was all work and never so much as a vacation. Exhausted he was at night, tired in the morning. He lived on the stimulants of duty performed, and on the intellectual and moral interest he took in his work, complaining only that he could not do it to his own satisfaction. Perhaps some of you remember having gazed at a statue in Munich. It represents a youth climbing upward, passing disdainfully the golden calf to attain what he evidently believes

to be a crown of laurel in the hands of the goddess. What he finally snatches is a crown of thorns. Still he climbs, maybe to reach the stars, to which Ralph Waldo Emerson bids us hitch our wagons. In spite of failures, I say to my young friends, hitch your wagon to the stars. Not everybody falls like Icarus, and the horizon enlarges from the heights. This your horizon, let it be vast; unless it be so, both the morals and the science and art of medicine will suffer. It is from that point of view also that I exhort my friends, either pure scientists or practitioners, never to forget that there is no antagonism between the two classes. The time is past, and partly through the efforts of your Academy, when the pure scientist looked upon practice as inferior, and the practitioner on pure science as beyond the pale and unpractical. Helmholtz, than whom this century has produced no more intense worker in pure science, proclaimed that mere knowledge is not the aim of man; that you may dignify it in two ways only, either by applying or by enlarging it. Knowledge without its application in the service of mankind, is like a library without readers, a museum without visitors, a symphony without hearers. Apply what you know and daily learn in the community's service. Do not forget that there is no power more worth possessing and inestimable than life and health. That truth is certainly in the minds of the American public, misguided though it be, when it feels like paying $200,000,000 annually for proprietary drugs. Nor should you be discouraged by what Pliny said and others credulously accept: "Say you are a physician, and you will be believed. Detract from your neighbor, and you will be considered superior." Mind what you may have read over the gate of a Swiss hospital, "*Res sacra miser.*" So your community, when in danger of health or life, is "*res sacra*" to you.

What has the Academy done for its members? As a

previous practice of three years in the city is required of a candidate, and the scrutiny of the committee on admission is always painstaking and fearless, the average standing and proficiency of the fellows is high and their moral tone elevated. The committee on ethics of former decades has, therefore, been abolished, together with the abrogation of the official code. No authoritative body of rules is required or recognized in place of the unwritten law of gentlemen. Alleged cases of transgression are relegated to the decision of the Council, but none was required for years. In the Academy of Medicine there are no professional politics. It is considered neutral ground, and the differences of schools, cliques, and combinations are supposed to be left behind when a fellow passes the entrance gate. Still, we are not all angels. That secret will come out some day, and may as well be whispered in public. That is why questions beyond the domain of the Academy are, however, forced in sometimes. That is to be deplored. Battle-fields there are as many in New York City as in the Virginia Wilderness, or about Lake George or ancient Rome; but Rome had its temples of Vesta and Peace. Let the profession of New York remember and revere the Academy as the one temple of safety, impartiality, and neutrality.

To none has the Academy been of more service than to the younger members. To become fellows after a fair examination of their claims to admission is in itself an honor and improves their standing. Besides, all of the eleven sections have been in working order these twelve years. That means that eleven times as many fellows found a direct encouragement for work, both in private and in public. In the section meetings, the future officers of the Academy and teachers of the profession find a new incentive to labor and research, and are always certain of an appreciative audience.

Our relations to the public at large and to the city and State have frequently been the subject of discussion. You may have been told that we demand special class legislation. If that were true, we, democratic American citizens, should be on the level of German students before they were deprived of their clannish jurisdiction, or of the Prussian military officer, whose *morale* is based on his sword, and sense of justice on the prerogatives of his degenerate nobility. In a few words, the public may learn the attempts on the part of the profession to secure a so-called special legislation. These twenty years we have been fighting in Albany for a preliminary education of matriculants, also for State examinations as a condition upon which alone the license to practise should be awarded. We, the Academy, in conjunction with the rest of the profession, have worked to increase the duration and the number of college courses. The profession, particularly as it is represented in the Medical Society of the State of New York, has secured laws against quackery, and the Medical Society of the County of New York has undertaken to extinguish it in this city. This committee sacrifices its time, and the society its own money, to combat frauds, quacks, and diploma mills. That does not look like class egotism. You should admit it is something entirely different unless you wish a low grade of knowledge in your medical advisers.

Your Academy and your profession were ever of the opinion that there must be no free trade in human flesh. Many of your old doctors were abolitionists when this nation was still disgraced by slavery. All of the old and young members who are imbued with respect for human life and health, and with the sense of their own responsibility, have combined to do your fighting, the community's fighting, against the dangers of quackery. It is not the existence of the profession, it is the safety of

you, the public, that is enhanced by your special legislation. Two things I have been told: sometimes one was that, no matter how low the standard of medical men was in some parts of the country, they were always superior to their community; the other word was, doctors were generally better than the public deserved or deserves. You can prove that such is not the case by co-operating with your doctors. We beg of you, we insist upon it, that you and your delegates, the legislators in Albany, may continue to protect you and yours from the inroads of charlatanry and ignorance. Do not forget, however, I speak here of the battle against positive ignorance, assumption, and downright illegal quackery.

The Academy does neither recognize nor fear, as in times long gone by, isms and sects, and for that very reason does not propose to war against them or even to denounce them. In its whole history of the last quarter of a century and perhaps longer, I fail to read of a case of persecution of a man or of a body of men directed against their scientific principles or prejudices. Moreover, to discuss honest scientific errors, alleged or real, in an inimical spirit is to endow them with new life. If there was animosity, it has been dying fast. Not that I mean to say that the medical world was always just. Semmelweiss, who was driven by his alleged peers into an insane asylum because he preached and practised upon the knowledge of the contagion of puerperal fever, about the same time that our own Oliver Wendell Holmes wrote his wonderful essay on the same subject, or our own Atlee, who was vilified and harassed because of his leading in an operation that at present is of daily occurrence, are evidences of shortsightedness and impressibility. Still, after having observed and co-operated with the profession in this city these forty-three, and with the Academy of Medicine these forty years, I know, though errors may have crept

in, that none but the purest and most altruistic motives have governed the actions of the profession. Least of all is Herbert Spencer correct when he says that "the incorporation of authorized practitioners has developed a trades-union spirit which leads to jealousy of the unincorporated practitioners, that is, the irregulars; and, like the religious priesthood, the priesthood of medicine persecutes heretics and those who are without diplomas." I trust the great philosopher's sympathy with heretics and those who are without diplomas will never revenge itself upon him and his health.

Great questions of the day have always inspired the medical profession. Both old Socrates and modern Kant expected the light pre-eminently from medicine. It is true that in the politics of our country we have but few medical combatants, compared with the good done by medical statesmen in Europe; but that of Benjamin Rush outweighs many names not belonging to his and our profession; and until the latest time physicians have participated in your reform movements. The Committee of Seventy of 1872 had among its most active members one of the most prominent men the New York Academy of Medicine ever counted among its own, Ernst Krackowizer. In public concerns the Academy was always interested. It took the initiative in many movements, the realization of which had long to wait. Medical school inspection, inaugurated just now, was urged by the profession in open meetings twenty-five years ago, and again by members of the Academy half a dozen years ago. The Willard Parker Hospital was planned and its organization pushed by a member of the Academy. Again it was a fellow of the Academy who renewed, if not instigated, the agitation for the new factory laws in behalf of women and children in 1882. Clean streets, or rather, muddy and unhealthy streets, also the tenement-house question, also school-

houses, and the reception hospital, were the subjects of many debates. It was a committee appointed, at the request of the Board of Health, which originally started in the Academy, and which, under the leadership of C. R. Agnew, whose mind and heart have immortalized him in the memory of those who were so fortunate as to live and work with him, reformed the quarantine of the port of New York, and elaborated the plans and estimates according to which the Legislature finally restored Hoffman and Swinburne Islands to their present condition. Another committee of the Academy looked after the Croton water and the water-shed.

It was through a committee of the Academy that medical inspection of the eyes of all the inmates was introduced in public institutions. If that practice were continued conscientiously, and attention to the eyes of the newly born suffering from the same contagious ophthalmia were made compulsory, there would be many vacancies in our future blind asylums.

The Academy's efforts, joining those of other medical bodies of the land in favor of the establishment of a National Board of Health, were, however, not successful. They will prove so in future. For just as certainly as this nation means to continue "now and forever, one and inseparable," its most sacred boons, viz., health and life, interdependent as they are over the vast area of the country, should be secured by uniform legislation. It was the Academy of Medicine, again, which was called upon to protect the port and the city against the invasion of cholera. That was four years ago—a long time, perhaps, for republican memories; but it is not forgotten that the committee men, though among the busiest of the city, were always at their post; that their efforts were successful and at that time appreciated; that they aided in keeping cholera out, and, at the same time, protected the com-

mercial interests of the country. We trust the Chamber of Commerce has not forgotten its own estimation, as then expressed, of the Academy's services. Nor have the poor of this city, and of others that imitated its example, a reason to forget the Academy. The agitation for the establishment of free public baths was begun by one of its fellows in 1890, and has resulted in the erection of four such institutions. Two hundred and fifty thousand people availed themselves of the opportunities thus offered in a single year.

The responsibility toward both the public and the profession was always deeply felt by the Academy. Its library is free to the whole profession, fellows or not, and to the public at large. Besides medical works, it has many of interest to the legal profession. By both it will be readily admitted that there are more useful and more congenial relations between them than when they meet in a court of justice, where the medical man, clad with the mantle of partisan expertship or expert partisanship, does not shine to advantage, and is apt to contribute less to the honor and dignity of his profession than to the miscarriage of justice.

The Academy's hospitality is constantly exhibited in the cases of the numerous national medical societies which convene gratis under our roof. The Society for the Relief of Widows and Orphans of Medical Men, the Saturday and Sunday Hospital Association, the Ladies' Protective Health Association, are made welcome on the same conditions.

The Academy is recognized as their head centre by other medical societies which cluster around it. It is in its section rooms or in Hosack Hall where they hold their regular meetings; one at least gave up its independent organization to become a section of the Academy. It cannot be avoided, however, that the generosity of the Acad-

emy is occasionally abused. Now and then we hear of desirable men who refuse to join and pay the annual contribution, on the plea that without personal membership they enjoy the privileges of those who pay their dues, that is, access to the building, the meetings, the papers, and the free library and reading room. Such occurrences do not prove much, while exhibiting the broad-mindedness of the Academy, except the occasional presence in the medical ranks of selfish men. Fate made a mistake when it admitted them to American citizenship and to a liberal vocation. Membership in a profession is by itself not sufficient to ennoble a man; it is the noble man who adorns and exalts his profession.

Nor do the academicians confine their labor to their own institution or to the city. There is no national association in which they are not interested and co-operating. It was a fellow of the Academy who established a section for diseases of children in the American Medical Association. Its members are largely represented in the Association of American Physicians, and in the American Surgical, Pædiatric, Climatological, Gynæcological, and other societies. In the transatlantic congresses, the British Medical Association, and the international medical congresses, their names are frequently met with.

What I could say, fragmentary though it be, should have convinced you that the best individual and collective efforts of the profession, as represented in the Academy, are being spent in the service of the community. In the same degree that the intellectual and scientific development of medicine and of the profession has been progressing, that service became more valuable. Now, on all your lips I am reading the question: What can the community do for the science and art and the profession of medicine, and particularly for that of the city?

The monarchies of Europe, particularly continental

Europe, have had medical schools these five hundred years; in this century their number increased. The facilities for teaching and learning were enlarged. In the last twenty-five years laboratories and clinics and libraries grew steadily with growing demands. The professors are salaried, their future is secured by pensions, their incidental expenses are paid, their lives are allowed to be dedicated exclusively to scientific research; for they and their children will not go hungry. All this is done without individual exertion or contributions. No matter whether wars crippled the means of the people, or whether militarism sucked the marrow of the land, or the sterile soil did not even feed the mostly agricultural population, the universities were provided for more or less generously by the government, at public expense.

With us the community is its own providence. The democratic citizens are their own sovereigns, and their means permit them to give way to their generosity. Schools, churches, nurseries, hospitals, libraries, have been its main beneficiaries. Medicine, however, has not yet received its full share. Still the benefactor of Johns Hopkins University and Hospital, the New York family that erected and endowed college buildings, laboratories, and hospitals for a medical school, the donors of the Carnegie and the Loomis laboratories, the founder of the Pepper Laboratory in Philadelphia, and of the Bender Laboratory of Hygiene in Albany, have accomplished exactly and often most generously, what is carried out by the sacrifices and exertions of whole monarchies. Again, only a week ago, we learned of the offer of $1,000,000, made by a fellow-citizen, to whom our Academy also is under obligations for powerful aid, for purposes both of relief and instruction. You call that "royal"? No, ladies and gentlemen, that is not royal; it is the spirit of republican citizenship, dreamt by a Plato, realized by an American. Nor

am I disposed to forget what we, the New York Academy of Medicine, owe to the New York public. It is with its spontaneous and valuable aid that we were enabled to erect the spacious and commodious building in which we hope to meet you again to-night. Though I am forbidden to mention the names of the living, I cannot abstain from recalling the ample bequest of the late Celine B. Hosack. It is to that liberality of the community that we have again appealed lately in our efforts to raise our library fund to $100,000. The response elicited thus far appears to justify our hope of attaining our ends in the nearest future; it certainly proves that a generous public appreciates the additional factors of learning and erudition in its skilled medical advisers.

Nor does the Academy appeal to you in its own behalf only. Every advance in the standard of medical education is a new ally to the Academy. The medical schools need endowments, like ourselves. Medical teachers are not rich; they should not be expected or made to look for a livelihood to the fees obtained from the students; that is a fact now acknowledged, and an ideal realized in the medical department of Columbia University. Laboratories of hygiene, chemistry, physics, botany, biology, should not be supported by the contributions of medical men only, or perhaps not at all. What monarchy is in the old world, that is democratic in the new, namely, the evidence and representation of the condition of its political and moral civilization? Hospitals you have built in large numbers, and in some instances more than required, and still some more are demanded. No scholar is imaginable without a library, no anatomist without a dissecting-room and a museum, no chemist or physicist or physiologist without experimentation, no medical graduate who is to practise on you and yours without instruction in a clinical hospital intimately connected with the medical school, and situated

on or near its grounds. Imagine, mothers, that every year hundreds of men and women begin the practice of medicine without ever having seen a baby sick in bed.

There is many another way in which the community may render itself useful to the medical profession. See to it that no personal interest, vanity, or misapprehension interfere with the progress of medicine. It is through our own efforts that we overcame the lack of knowledge on the part of legislators, and the opposition of medical schools, when we enforced a certain amount of preliminary education and the establishment of State examinations. See that these your gains, for they are yours, be not taken away from you; they were conquered in your behalf. See that scientific study and progress are not shorn of their prerogatives, that is, experimentation, and that your legislators are not influenced except by facts. When, for instance, agitators speak to you of the cruelties of vivisection, remember that they select that hard word in order to conceal what it means, that is, animal experimentation, which is already secured and protected against barbarousness and cruelty by a well-adjusted and satisfactory law, that was passed by former legislatures and ought to be left intact. Tell them also that you know that the action of many therapeutical remedies useful to them and their children could be studied by animal experimentation only; that one of the most formidable calamities of former times, the terror of every woman who was to become a mother, childbed fever, has been reduced to the very lowest figure wherever the teachings of animal experimentation have been headed; that hydrophobia, always fatal, has been made accessible to treatment with at least fair results; that tuberculosis may be and is in part confined within certain limits; that the prevention of cholera, even that of the plague, is no longer a dream; that the mortality of diphtheria is reduced to nearly one-half of what it was;

that quite certainly the future therapeutics of scarlet fever, measles, typhoid fever, and other scourges of mankind will be based on antitoxins; that the success of surgical operations under the influence of antisepsis and asepsis is simply marvellous; and that all these blessings are the direct result of animal experimentation. Tell them also that the horse or sheep that furnishes the antitoxin which is to save American children does not even suffer, and if it comes to the worst, if rabbits and guinea-pigs have to be sacrificed by humane men armed with skill and anæsthesia, that the future ought to belong as much to mankind, ay, more to mankind, than to rabbits and guinea-pigs, or to those animals that you hunt over fences and brooks, and, with the permission of the law, shoot to death amidst the excited laughter of sport, but pretend to shed tears over, when science tries to fathom new wonders, to establish more firmly the foundations of health and life for old and young, and to discover new means of salvation for this republic and mankind.

In what I state I identify the demands of the profession at large and of medical science with those of the New York Academy of Medicine. Ours is "*Una fides, altare commune*," one faith and a common altar. That shibboleth you will find is the sole inscription on our home in Forty-third Street. What you will do for one you will be doing for all. Whatever you do, you will contribute to the medicine of the present and of the future, and to the great work in store for it. We know that it is levity only that makes empty hypotheses, sometimes, unfortunately, even laws; that much labor, however, and hard work are required to obtain great results. In all humility, but with earnestness, medical men tender you their labor in practice, in hospitals, on the teachers' platform, in the laboratories. What they expect and look forward to is appreciation, not of the individual, but of the aggregate work, and co-

operation on the part of the public, for the immediate results of our work are at the same time humane and practical. The reduction in your death-rate of one in a thousand means, beyond the saving of one life, a lowering of more than thirty in the total number of cases of sickness, and therewith prevention of much anxiety, wretchedness, and financial loss or ruin in as many families. Results like these are liable to be accepted as natural; they are claimed, as it were, as the normal appendages of modern civilization. It should not be forgotten, however, that they are obtained only by the work of medical men who labor for the good they can do, often as hermits, unknown, and unappreciated, always bent upon the diminution of the number of problems which hitherto were deemed hopeless. The medical searcher is like the astronomer who differentiates in nebulous distances stars big and small, luminous and dark, fixed and migrating. More than any other man, he spies for the relation and connection of things and phenomena, and becomes the true philosopher and physician, who was called godlike by a great poet three thousand years ago.

Much of what I touched upon has been, or is being, accomplished. The rapidly increasing facilities of investigation have changed the methods and aspects of modern medicine to such an extent as to make me anxious to know what the orator of the next semi-centennial celebration will have to say to you. Part of it I know, and you will know it too when I beg you to consider with me during the last minute of my address the possibilities and the certainties of medicine. Its methods of investigation will never be changed, for they have become those of natural science, and these, because they are based on observation and experimentation, are unalterable. Indeed, medicine is a part of the natural sciences; the human organism, well and sick, physical and spiritual, is the subject

of its scrutiny. Man's nature, both normal and abnormal, belongs to the domain of medical inquiry. Psychology has for some time past become a branch of physiology. The sound mind, its aberrations and freaks, the soul with its holiness or turpitude, no matter whether considered by the believing philosopher or the searching materialist, are topics of biological study. The explanation and relations of most intimate physical and psychical processes are sought for, will always be sought for, by the sanitarian, the teacher, the clergyman, the judge, the statesman. It is in medicine that they will find them. The time will soon come when the culture of a nation will be estimated according to the mutual relations of medicine and the people.

Is this an ideal? It is, but no Utopia. Indeed, much of what was an ideal twenty-five years ago has been achieved. It is probably true, however, that no ideal will ever meet with its entire consummation, and ideals will be modified or expanded. Nor do I believe that even the star guiding the three sages of the East shone always with equal splendor. Thus it is possible that what I earnestly hope for in the next half-century will not be completely fulfilled; but woe to the man, to the profession, to the nation, without an ideal as a guiding star. To medicine in its legitimate and just meaning that star is the improvement of man both individually and collectively. It demands and promises the combination of scientific research into the wants of mankind, with the application of preventives and remedies for its physical, intellectual, and moral dangers and defects. To keep and fortify medicine on that platform is the ideal of our calling. By working for it, medicine and medical men may create that power which alone protects individuals against hebetude or despair, and nations against wreck and perdition. That power is benevolence, beneficence, and mutual assistance.

In introducing the President of the United States, the President of the Academy said:

"It is now our distinguished honor to welcome a gentleman whose deep interest in the affairs of the Academy of Medicine has caused him to lay aside for a brief time the duties of his great office, that he might join with us in the ceremonies of the occasion. It is my great pleasure to present to you one for whom sincere men have a profound respect, patriotic people a high esteem, and intimate friends an abiding affection."

Mr. President and Ladies and Gentlemen:

I have anticipated the share assigned to me on this occasion with considerable trepidation, for various reasons. I have been chiefly disturbed, I believe, because of my inability to discover sufficient ground for my right to join those who celebrate the semi-centennial of a medical association.

If, in passing through that period in boyhood when the desirable choice of future activity seemed to rest between running away from home to be a sailor and staying at home to be a doctor, I inclined toward the more quiet and orderly of these pursuits, this surely furnishes no basis at this late day for a claim of relationship to the medical fraternity. Nor do I forget that less than seven years ago I was accorded the privilege of participating in the exercises when the corner-stone was laid of the building which is now the home of the organization which to-night celebrates its half-century of useful and honorable existence. But this incident which aroused an interest, still undiminished, in the welfare of the Academy of Medicine, hardly entitles me to a share in the felicitations of those who have since borne the heat and burden of its work while I have enjoyed the ease and happy surroundings of public station.

Confessing, therefore, that I have no right to even standing-room within the inner circle of the profession, I have boldly and without the least authority determined to speak to you as a representative of the vast army of patients and laymen.

At the outset I desire to remind you that you owe us much. Though largely in the majority and with plenty of members to spare, those who are well-conducted among us do not vex you with hurtful competition. Instead of making life hard for you by an observance of the laws of health, we assist you by indulging in all sorts of irregularities. We are obedient and submissive to your commands, that is, when we are sick, and we sometimes pay your bills even after a recovery to health, which we are always certain would have resulted without your interference.

In these circumstances, if when in perfect health we venture to assert ourselves and tell you what is in our minds, it is not fair to liken us to a certain personage who when sick a saint would be, though very differently inclined when well.

We begin by conceding most heartily and without the least reservation the learning and skill of those now constituting the medical profession, and the wonderful advance that has been made through their untiring labors and investigations, in the alleviation of human suffering and the saving of human life.

It may be that this seems to you an acknowledgment so much your due as to be hardly worth making. You should, however, value it because it is sincerely made by those who were not born yesterday, but who hold in lasting and tender memory the ministrations of the village doctor of fifty years ago, and are now the living monuments of his faithful care. He, too, alleviated suffering and saved human life. We know that it was not given to

him to see the bright lights that now mark the path of medicine and surgery, but you cannot convince us that he groped entirely in the dark. We remember with abhorrence his ever-ready lancet, and the scars of his bloodletting found in every household. We endure with complacency the recollection of his awful medicine-case, containing bottles, powders, and pills, which, whatever might be thought of them now, seemed then to be sufficient for all emergencies, to say nothing of the tooth-pulling tools and other shiver-breeding instruments sometimes exposed to view. If he was ignorant of many of the remedies and appliances now in use, he in a large measure supplied the deficiency by hard-headed judgment, well-observed experience, and careful nursing. Besides, it was in his favor that he did not have to bother his head with many of the newly invented and refined diseases that afflict mankind to-day. He had no allotted hours for his patients, but was always on duty, and we knew the sound of his gig as it rattled past in the night.

Your ways are better than his; but we desire you to regard this admission as all the more valuable because it is carved out of our loyalty to our old village doctor, who brought us through the diseases of childhood without relapse, who saved from death our parents and our brothers and our sisters in many a hard combat with illness, and who, when vanquished and forced to surrender, was present in the last scene to close the eyes of his dying patient and sympathize with those who wept.

I hasten to say that we do not for a moment suppose that advancement in the science of medicine and surgery has smothered the faithfulness and tender consideration which characterized the practitioner of former days. If we seek charitable service to the sick and suffering, a noble appreciation of obligation to humanity, and self-abnega-

tion in the discharge of professional duty, we must look for them among our physicians and surgeons of to-day.

If we have now arrived at an understanding, you are, I hope, prepared for a suggestion quite in keeping with the extremely moderate and reasonable disposition that characterizes the patient and layman. You have invaded our benighted contentment and led us out into broad fields of scientific discovery. This has inspired us with a newborn spirit of wisdom and criticism, which demands that new and larger fields be opened to our complacent gaze. You have penetrated the places where the germs of disease are hidden. We are quite certain that you should be required to destroy the origin of disease and ultimately usher in the day when the only escape from the world will be through a passage-way marked "Old-age exit." If this has the appearance of exacting too much, or if business considerations present obstacles to its accomplishment, I think we ought, perhaps, to reduce our claims, or at least give our doctors time to find other employment.

In the meantime those of us who are conservative must be allowed to hope that further investigation will continue to point the way to the prevention of disease. For this investigation we must still rely upon the efforts of those who have already done so much in that direction, encouraged and stimulated by such effective organizations as the Academy of Medicine. We are sure that this work, having arrested the attention of the world's brotherhood of medical science, will not be neglected, nor need we fear that America's contribution to splendid results will be deficient.

In some instances, however, investigation has performed its part, and only effective action in other quarters is necessary to supply needed remedies. In such cases, of course, you are absolved from all responsibility in your professional character by exhibiting dangers and warning

against them. Thus, certain diseases which you deem contagious, yet remain imperfectly isolated. You have demonstrated the peril to health of unwholesome water and noxious surroundings, and yet much remains to be done by way of protecting our people against these dangers. You have established a code of ethics which condemns charlatanism in all its forms, and yet ignorant pretenders roam over the land offering to perform miracles, or are located in our towns and cities, preying upon the weakness of the sick and afflicted, while men and women are allowed to die without medical attendance, deluded with the hope that faith will save them in their last extremity. Within the limits of your professional power and influence you seek to restrain any approach to criminal malpractice, yet newspapers disgustingly, though covertly, advertise the way to such crimes, and startle their readers with sensational tales of death and misery to which they are directly accessory.

I need not suggest that such evils are allowed to exist by reason of the insufficiency of our laws or a laxity in their execution. I have intimated that for this condition you are not responsible, in a professional sense; but are you sure that as citizens you are doing all in your power to remedy the situation?

The village doctor was not only our physician, but he was a man of influence in all neighborhood affairs. In every matter that concerned the good of the community he was at the front. He was President of the Village or represented his town in the County Board of Supervisors; and if he was ever late in visiting a patient it was because he lingered at the post-office to discuss the political situation. Thus he joined with the performance of professional duty a discharge of the obligations of citizenship.

We cannot but think that the discoveries and improvements in medical practice which we now enjoy are dearly

bought if the members of the profession in their onward march have left behind them their sense of civic obligation and their interest in the general public welfare. We cannot accuse you of utter neglect of your duty to the country; and yet we cannot keep out of mind the suspicion that if your professional work in exposing evils was more thoroughly supplemented by labor in the field of citizenship these evils would be more speedily corrected.

If laws are needed to abolish abuses which your professional investigations have unearthed, your fraternity should not be strangers to the agencies which make the laws. If enactments already in force are neglected or badly executed, you should not forget that it is your privilege and duty to insist upon their vigorous and honest enforcement. Let me also remind you of the application to your case of the truth embodied in the homely injunction: "If you want a job well done, do it yourself." If members of your profession were oftener found in our national and State legislative assemblies, ready to advocate the reformatory measure you have demonstrated to be necessary, and to defend your brotherhood against flippant and sneering charges of impracticability, the prospect of your bestowal upon your fellow-men of the ripened results of your professional labor would be brighter and nearer.

While thus suggesting the need of your influence in legislative circles for the accomplishment of reforms related to your profession, you will, I hope, permit me in conclusion to enjoin upon you the duty of an active and general interest and participation in public affairs for the promotion of your country's good in all phases. Our Government was founded in the faith and anticipation that those who loved it most and were best able to hold it steady would be at its helm. Without this it would surely go astray. Never did patient need your medical

treatment more than the body politic now needs the watchful care of your patriotic and disinterested citizenship.

No object of personal ambition and no activity of professional life should be permitted to withhold from our Government the tithe of devotion and service due from its thoughtful, intelligent, and educated citizens. The reward of a willing recognition of our obligation to watch and protect our free institutions and preserve them from weakness and decay will surely come when a just government, supported by the patriotism of a loving people shall bestow with equal hand, upon us and all our countrymen, the blessings of national peace, contentment, and happiness.

Mr President and Ladies and Gentlemen:

I have anticipated the share assigned to me on this occasion with considerable trepidation for various reasons, but chiefly I believe because of my inability to discover sufficient ground for my right to join in the celebration of the semi-centennial of a medical association.

If in passing through the period of boyhood when the choice of future activity seemed to rest between running away from home to be a sailor and staying at home to be a doctor, I inclined towards the more quiet and orderly of these pursuits this surely furnishes no basis at this late day for a claim of relationship to the medical fraternity. I remember too that less than seven years ago, I was accorded the privilege of participating in the exercises attending the laying of the corner stone of the building which is now the home of the organization which too might celebrate its half-century of useful and honorable existence; but this incident, though it assumed an interest still undiminished in the welfare of the Academy of Medicine, hardly entitled me to a share in the felicitations of those who have seen borne the heat and burden of its work while I have enjoyed the ease and happy surroundings of public station.

Confessing therefore that I have no right

to even standing - even within the inner circle of the profession, I have boldly and without the least authority determined to speak to you as a representative of the vast army of patients and laymen.

Ah the entreat I desire to remind you that you owe us much. Though largely in the majority and with plenty of restless members to spare, there of us who are well conducted do not vex you with hurtful competition. and instead of making life hard for you by an observance of the laws of health, we assist you by indulging in all sorts of irregularities. We are obedient and submissive to your commands — that is when we are sick — and we sometimes pay your bills even after our recovery to health, and when we are perfectly certain we would have recovered without your interference.

In view of your obligations to us, if we when in perfect health and free from your controls, venture to assert ourselves and tell you plainly what is in our minds, it is manifestly unkind and unfair to liken us to a certain personage who when sick "a mouse would be", though very differently inclined when well.

We begin by conceding much heartily and without the least reservation, the learning and skill of those now constituting the medical profession, and the wonderful

advance that has been made through their untiring labors and investigations, in the alleviation of human suffering and the saving of human life.

It may be that this seems to you an acknowledgment so clearly you dare that it is hardly worth making. You should however value it, because it is sincerely made on behalf of those who were not been yesterday and who hold in lasting and tender memory the ministrations of the village doctor of fifty years ago, and are now the living monuments of his faithful care. He has alleviated suffering and saved human life. We know that it was not given to him to see the bright light that now marks the path of medicine and surgery; but you cannot convince us that he grasped entirely in the dark. We remember without abhorrence his ever ready lancet and the scars of his blood letting found in every household. We endeavor with complacency the recollection of his useful medicine case with its bottles, powders and pills which, whatever may be thought of them now, seemed then to be sufficient for all emergencies to say nothing of his tool pulling tools and other shiver bending instruments sometimes exposed to view. If he was ignorant of many of the remedies and appliances now in use, he in a large measure supplied the deficiency by hard headed judgment, well absorbed experience and careful nursing. Besides, it was in his favor

BOSTON MEDICAL
JAN 22 1904
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that he was not obliged to bother his head with many of the newly invented and refined diseases that afflict mankind to-day. He had no allotted hours for his patients, but was always on duty; and we knew the sound of his gig as it rattled back in the night.

While we admit that your ways are better than his, we ask you to regard this admission as all the more valuable because it is caused out of our loyalty to our old village doctor, who brought us through the diseases of childhood without a chapter, who saved from death our parents, our brothers and our sisters in many a hard combat with illness, and who when vanquished and forced to surrender, was present in the last scene to close the eyes of his dying patients and sympathize with those who wept.

I hasten to say that we do not for a moment suppose that advancement in the science of medicine and surgery have smothered the faithfulness and tender consideration which characterized the practitioner of former days. If to-day we seek charitable service to the sick and suffering, a noble appreciation of obligation to humanity, and self-abnegation in the discharge of professional duty; we must still look for it among our physicians and surgeons.

If we have now arrived at an understanding I hope you are prepared for a suggestion quite in keeping with the extremely modest and reasonable disposition always

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characteristic of the patient and layman. You have invaded our benighted contentment and led us only into broad fields of scientific discovery. This has inspired us with a new born spirit of wisdom and criticism which demands that now and larger fields be opened to our complacent gaze. You have penetrated the places where the germs of disease are hidden. We are now quite prepared to insist that with due regard to our precious lives and the immense importance of their prolongation, you should as soon as it can be done with propriety and convenience abolish sockness and destroy the origin of disease. We are not inclined to be unreasonable in our exactions; and if business considerations present themselves as obstacles to these results, we might perhaps reduce our demands, or consent to a postponement of the time when the only escape from the world will be through the old age exit, until our doctors succeed in finding new occupations.

In any work there of us who are much conversative and reasonable expect that continued investigation will still point the way to the prevention of disease. For this investigation we are quite willing to rely upon the efforts of those who have already done so much in that direction, and upon the encouragement and stimulation of such effective organizations as the Academy of Medicine. We do not doubt that this work having already thoroughly arrested the attention of the world's

Brotherhood of medical science, will be actively prosecuted, and we doubt that America's contribution to its splendid results will be deficient.

In some fields however investigation has performed its part and only effective action in other quarters or merely to insure needed remedies. In such cases, having exhibited dangers and warned against them, you are absolved from all responsibility in your professional character. For certain diseases which you deem contagious are imperfectly isolated. You have demonstrated the peril to health of unwholesome water and noxious surroundings; and yet much remains to be done by way of protecting our people against these dangers. You have established a code of ethics which condemns charlatanism in all its forms; and yet ignorant pretenders roam over the land offering to perform miracles, or are located in our towns and cities, prying upon the weakness of the sick and afflicted, while men and women are allowed to die without medical attendance. Deluded with the hope that faith will save them in their last extremity. Within the limits of your professional power and influence, you seek to restrain any approach to criminal malfactors; yet newspapers disgustingly though covertly advertise the way to such crimes and startle their readers with sensational tales of death and misery to which they are directly accessory.

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which your professional investigations have unearthed, your fraternity should not be strangers to the agencies which make the laws. If enactments already in force are neglected or badly executed, you should not forget that it is your privilege and duty to insist upon their vigorous and honest enforcement. Let me also remind you of the application to your case of the truth embodied in the homely injunction "If you want a job well done, do it yourself." If members of your profession were oftener found in our national and State legislative assemblies, ready to advocate the reformatory measures you have demonstrated to be necessary, and to defend your brotherhood against flippant and sneering charges of impracticability, the prospect of your bestowal upon your fellow men of the referred results of your professional labor would be brighter and nearer.

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No objects of personal ambition, and no activity of professional life should be permitted to withhold from our government the tithe of devotion and service due from its thoughtful, intelligent and educated citizens. The reward of a willing recognition of our obligation to watch and protect our free institutions, and preserve them from weakness and decay, will surely come when a just government supported by the patriotism of a loving people shall bestow with equal hand upon us and all our countrymen, the blessings of national peace, contentment, and happiness

COPY OF THE ORIGINAL CONSTITUTION OF THE NEW YORK ACADEMY OF MEDICINE.

ADOPTED JANUARY 6, 1847.

EXTRACT FROM THE MINUTES OF A MEETING OF THE NEW YORK ACADEMY OF MEDICINE, HELD JANUARY 6, 1847.

Dr. John Stearns in the Chair.

CONSTITUTION.

Art. 1. This Association shall be called the "New York Academy of Medicine," and be composed of Resident and Corresponding Fellows.

Art. 2. The objects of the Academy shall be:

First. The separation of the Regular from Irregular Practitioners.

Second. The association of the Profession Proper for purposes of mutual recognition and fellowship.

Third. The promotion of the character, interests, and honor of the fraternity, by maintaining the union and harmony of the regular profession of the city and its vicinity, and aiming to elevate the standard of Medical Education.

Fourth. The cultivation and advancement of the science, by our united exertions for mutual improvement, and our contributions to Medical Literature.

Art. 3. The Resident Fellows shall be regular Practitioners of Medicine or Surgery in the City of New York, or its vicinity; shall be proposed by a Fellow of the Academy to the Committee on Admissions, which shall satisfy itself of the regular standing of the candidate, by cre-

dentials or otherwise, and upon its recommendation, he may be admitted by a vote of the Academy, at a regular meeting. A residence of three years in this city or vicinity shall be necessary to eligibility in the Fellowship of the Academy.

Art. 4. No Proprietor or Vender of any patent or secret remedy or medicine, nor any Empirical or Irregular Practitioner, shall either be admitted to or retained in the Fellowship of this Academy.

Art. 5. Corresponding Fellows may be elected on the nomination of the Committee on Admissions, which shall vouch for their being duly qualified Practitioners; but the votes of three-fourths of the Fellows present, at a regular meeting, shall be necessary for such election. The number of Corresponding Fellows shall be limited to one hundred.

Art. 6. The officers of the Academy shall be a President, four Vice-Presidents, a Recording Secretary, two Corresponding Secretaries, designated for Domestic and Foreign Correspondence, a Treasurer, and a Librarian; who shall be elected annually by ballot at the regular meeting in January. They shall severally perform the duties indicated by the title of their respected offices.

Art. 7. The President shall appoint, immediately after his election, the following Standing Committees, each of which shall consist of five Resident Fellows:

First. A Committee on Admissions.

Second. A Committee on Finance.

Third. A Committee on Medical Ethics.

Fourth. A Committee on Publication.

Fifth. A Council of Appeal.

Art. 8. Alterations of this Constitution shall not be made except at a meeting subsequent to that at which such alteration shall have been proposed in writing.

A LIST OF THE OFFICERS OF THE NEW YORK ACADEMY OF MEDICINE,

FROM 1847 TO 1897.

OFFICERS—1847.

President ..... John Stearns, M.D.

Vice-Presidents ..... Francis Upton Johnston, M.D.
Thomas Cock, M.D.
John Brodhead Beck, M.D.
John Wakefield Francis, M.D.

Recording Secretary ..... Ferdinand Campbell Stewart, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... Benjamin Drake, M.D.
Treasurer ..... Roberts Watts, M.D.
Librarian ..... Thomas Masters Markoe, M.D.
Orator ..... John Wakefield Francis, M.D.

OFFICERS—1848.

President ..... John Wakefield Francis, M.D.

Vice-Presidents ..... Thomas Cock, M.D.
John Brodhead Beck, M.D.
John Kearny Rodgers, M.D.
William W. Miner, M.D.

Recording Secretary ..... Ferdinand Campbell Stewart, M.D.
Assistant Secretary ..... Marcus Lorenzo Taft, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... Gurdon Buck, M.D.
Treasurer ..... James Otis Pond, M.D.
Librarian ..... Thomas Ferris Cock, M.D.
Orator .. .. James Robert Manley, M.D.

OFFICERS—1849.

President ..... Valentine Mott, M.D.

Vice-Presidents ..... Isaac Wood, M.D.
James Robert Manley, M.D.
Galen Carter, M.D.
Thomas Cock, M.D.

Recording Secretary ..... John Ledyard Vandervoort, M.D.
Assistant Secretary ..... Thomas Morris Franklin, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... John Glover Adams, M.D.
Treasurer ..... James Otis Pond, M.D.
Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... Alfred Charles Post, M.D.

OFFICERS—1850.

President ..... Isaac Wood, M.D.
Vice-Presidents ..... Galen Carter, M.D.; Joseph Mather Smith, M.D.; James Cotton Bliss, M.D.; Alfred Charles Post, M.D.
Recording Secretary ..... John Glover Adams, M.D.
Assistant Secretary ..... Jackson Bolton, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... Edward Langdon Beadle, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... James Anderson, M.D.; Galen Carter, M.D.; Edward Langdon Beadle, M.D.; Willard Parker, M.D.; John Kearny Rodgers, M.D.; John Hoskins Griscom, M.D.
Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... Joseph Mather Smith, M.D.

OFFICERS—1851.

President ..... Alexander Hodgdon Stevens, M.D.
Vice-Presidents ..... Galen Carter, M.D.; Joseph Mather Smith, M.D.; John Kearny Rodgers, M.D.; John Putnam Batchelder, M.D.
Recording Secretary ..... John Glover Adams, M.D.
Assistant Secretary ..... Jackson Bolton, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... Edward Langdon Beadle, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... James Anderson, M.D.; Galen Carter, M.D.; Edward Langdon Beadle, M.D.; Willard Parker, M.D.; John Kearny Rodgers, M.D.; Isaac Wood, M.D.
Librarian ..... Thomas Ferris Cock, M.D.

OFFICERS—1852.

President ..... Thomas Cock, M.D.
Vice-Presidents ..... Joseph Mather Smith, M.D.; James Anderson, M.D.; John Putnam Batchelder, M.D.; Gurdon Buck, M.D.
Recording Secretary ..... Jackson Bolton, M.D.
Assistant Secretary ..... George Absalom Peters, M.D.
Domestic Corresponding Secretary.. William Currie Roberts, M.D.
Foreign Corresponding Secretary... Edward Langdon Beadle, M.D.

Treasurer ..... James Otis Pond, M.D.

Trustees ..... James Anderson, M.D.
Galen Carter, M.D.
Edward Langdon Beadle, M.D.
Willard Parker, M.D.
John Glover Adams, M.D.
Isaac Wood, M.D.

Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... Thomas Ferris Cock, M.D.

OFFICERS—1853.

President ..... Isaac Wood, M.D.

Vice-Presidents ..... Edward Langdon Beadle, M.D.
Ferdinand Campbell Stewart, M.D.
William Detmold, M.D.
Willard Parker, M.D.

Recording Secretary ..... Samuel Augustus Purdy, M.D.
Assistant Secretary ..... John Foster Jenkins, M.D.
Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... Samuel Conant Foster, M.D.
Treasurer ..... James Otis Pond, M.D.

Trustees ..... James Anderson, M.D.
Galen Carter, M.D.
William Nelson Blakeman, M.D.
William Rockwell, M.D.
Richard Sharp Kissam, M.D.
Benjamin Ogden, M.D.
Samuel Pomeroy White, M.D.

Librarian ..... Thomas Ferris Cock, M.D.

OFFICERS—1854.

President ..... Joseph Mather Smith, M.D.

Vice-Presidents ..... James Anderson, M.D.
Edward Langdon Beadle, M.D.
William Detmold, M.D.
John Hoskins Griscom, M.D.

Recording Secretary ..... Samuel Augustus Purdy, M.D.
Assistant Secretary ..... Edwin Bolles Stimson, M.D.
Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... Samuel Conant Foster, M.D.
Treasurer ..... James Otis Pond, M.D.

Trustees ..... James Anderson, M.D.
Galen Carter, M.D.
William Nelson Blakeman, M.D.
William Rockwell, M.D.
Richard Sharp Kissam, M.D.
Benjamin Ogden, M.D.
Samuel Pomeroy White, M.D.

Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... John Hoskins Griscom, M.D.

OFFICERS—1855.

President ..... John Wakefield Francis, M.D.

Vice-Presidents ..... Edward Langdon Beadle, M.D.
Ferdinand Campbell Stewart, M.D
Gurdon Buck, M.D.
William Detmold, M.D.

Recording Secretary ..... Samuel Conant Foster, M.D.
Assistant Secretary ..... John Winantz Greene, M.D.
Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... John Glover Adams, M.D.
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William Nelson Blakeman, M.D.
William Rockwell, M.D.
Richard Sharp Kissam, M.D.
Benjamin Ogden, M.D.
Samuel Pomeroy White, M.D.

Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... John Watson, M.D.

OFFICERS—1856.

President ..... Willard Parker, M.D.

Vice-Presidents ..... John Watson, M.D.
Jackson Bolton, M.D.
Gurdon Buck, M.D.
Edward Langdon Beadle, M.D.

Recording Secretary ..... Samuel Conant Foster, M.D.
Assistant Secretary ..... William Frederick Holcombe, M.D.
Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.

Trustees ..... James Anderson, M.D.
Galen Carter, M.D.
William Nelson Blakeman, M.D.
John Hoskins Griscom, M.D.
Richard Sharp Kissam, M.D.
Benjamin Ogden, M.D.
Samuel Pomeroy White, M.D.

Librarian ..... Thomas Ferris Cock, M.D.

OFFICERS—1857.

President ..... Valentine Mott, M.D.

Vice-Presidents ..... James Rushmore Wood, M.D.
Edward Langdon Beadle, M.D.
John Watson, M.D.
Benjamin Fordyce Barker, M.D.

Recording Secretary ..... Charles Frederick Heywood, M.D.
Assistant Secretary ..... Francis Upton Johnston, Jr., M.D.

Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... James Anderson, M.D.; Galen Carter, M.D.; William Nelson Blakeman, M.D.; John Hoskins Griscom, M.D.; Richard Sharp Kissam, M.D.; Benjamin Ogden, M.D.; Samuel Pomeroy White, M.D.
Librarian ..... Thomas Ferris Cock, M.D.
Orator ..... James Marion Sims, M.D.

OFFICERS—1858.

President ..... John Putnam Batchelder, M.D.
Vice-Presidents ..... Charles Edward Isaacs, M.D.; William Holme Van Buren, M.D.; John Watson, M.D.; Samuel Conant Foster, M.D.
Recording Secretary ..... Charles Frederick Heywood, M.D.
Assistant Secretary ..... Francis Upton Johnston, Jr., M.D.
Domestic Corresponding Secretary.. Samuel Thomas Hubbard, M.D.
Foreign Corresponding Secretary... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... James Anderson, M.D.; Galen Carter, M.D.; William Nelson Blakeman, M.D.; John Hoskins Griscom, M.D.; Richard Sharp Kissam, M.D.; Benjamin Ogden, M.D.; Edward Langdon Beadle, M.D.
Librarian ..... Samuel Rotton Percy, M.D.
Orator ..... Edmund Randolph Peaslee, M.D.

OFFICERS—1859.

President ..... John Watson, M.D.
Vice-Presidents ..... Samuel Conant Foster, M.D.; Joel Foster, M.D.; Gurdon Buck, M.D.
Recording Secretary ..... Theodore Gaillard Thomas, M.D.
Assistant Secretary ..... Francis Upton Johnston, Jr., M.D.
Corresponding Secretary ..... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... Joseph Mather Smith, M.D.; Richard Sharp Kissam, M.D.; James Anderson, M.D.; Samuel Thomas Hubbard, M.D.; Isaac Wood, M.D.
Librarian ..... Samuel Rotton Percy, M.D.
Orator ..... William Currie Roberts, M.D.

OFFICERS—1860.

President ..... John Watson, M.D.
Vice-Presidents ..... Joel Foster, M.D.; Gurdon Buck, M.D.; Moses Depew Van Pelt, M.D.
Recording Secretary ..... Theodore Gaillard Thomas, M.D.
Assistant Secretary ..... John Henry Hinton, M.D.
Corresponding Secretary ..... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... James Anderson, M.D.; Jacob Harsen, M.D.; Richard Sharp Kissam, M.D.; Samuel Thomas Hubbard, M.D.; Isaac Wood, M.D.
Librarian ..... Samuel Rotton Percy, M.D.
Orator ..... John Watson, M.D.

OFFICERS—1861.

President ..... James Anderson, M.D.
Vice-Presidents ..... Joel Foster, M.D.; Moses Depew Van Pelt, M.D.; Alfred Charles Post, M.D.
Recording Secretary ..... Theodore Gaillard Thomas, M.D.
Assistant Secretary ..... John Henry Hinton, M.D.
Corresponding Secretary ..... John Winantz Greene, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... Jacob Harsen, M.D.; Richard Sharp Kissam, M.D.; Benjamin Ogden, M.D.; Samuel Thomas Hubbard, M.D.; Isaac Wood, M.D.
Librarian ..... Gouverneur Mather Smith, M.D.

OFFICERS—1862.

President ..... James Anderson, M.D.
Vice-Presidents ..... Moses Depew Van Pelt, M.D.; Alfred Charles Post, M.D.; Henry Daggett Bulkley, M.D.
Recording Secretary ..... John Henry Hinton, M.D.
Assistant Secretary ..... Fessenden Nott Otis, M.D.
Corresponding Secretary ..... John Glover Adams, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... Samuel Thomas Hubbard, M.D.; Isaac Wood, M.D.; Jacob Harsen, M.D.; John Robert Van Kleek, M.D.; Joel Foster, M.D.
Librarian ..... Gouverneur Mather Smith, M.D.
Orator ..... Samuel Conant Foster, M.D.

OFFICERS—1863.

President ..... James Anderson, M.D.
Vice-Presidents ..... Alfred Charles Post, M.D.; Henry Daggett Bulkley, M.D.; Alfred Underhill, M.D.
Recording Secretary ..... John Henry Hinton, M.D.
Assistant Secretary ..... Fessenden Nott Otis, M.D.
Corresponding Secretary ..... John Glover Adams, M.D.
Statistical Secretary ..... John Hoskins Griscom, M.D.
Treasurer ..... James Otis Pond, M.D.
Trustees ..... Isaac Wood, M.D.; Isaac Ebenezer Taylor, M.D.; John Robert Van Kleek, M.D.; Joel Foster, M.D.; Samuel Thomas Hubbard, M.D.
Librarian ..... James Lenox Banks, M.D.
Orator ..... John William Draper, M.D.

OFFICERS—1864.

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THE ETIOLOGY AND CLASSIFICATION OF INFECTIOUS DISEASES.

WESLEY M. CARPENTER LECTURE FOR 1896.

BY GEORGE M. STERNBERG, M.D., LL.D.,

Surgeon-General, U. S. A.

The additions which have been made to our knowledge relating to the etiology of infectious diseases during the past thirty years are generally recognized as constituting a substantial basis for scientific medicine. We are not yet entirely released from the trammels of unsupported theories and traditions, but the sun of science is already approaching the horizon and gives light enough to enable us to perceive a broad and attractive landscape, a portion of which is still obscured by shadows which will no doubt soon be dissipated by the advancing source of light and life. Those of us who graduated prior to the dawning of this new light are best able to appreciate the importance of the recent additions to our knowledge in this fundamental department of medicine. I confess that etiological studies have always had a special attraction for me; and it has seemed to me that a general review of the evidence relating to the etiology of the infectious diseases might not be out of place on the present occasion. The facts which I shall present will not, of course, have the charm of novelty, since those who constitute my audience are physicians who have no doubt kept pace with the progress of discovery in this field of investigation.

It is hardly necessary to say that by "infectious diseases" we mean those diseases which result from the in-

troduction into the body of some disease-producing agent. And I think we are justified in saying that an essential condition of infection is that the disease-producing agent shall be capable of reproduction in the body of the infected individual—in other words, that it is a living organism. It matters not whether this living organism is large or small; whether it belongs to the animal or vegetable kingdom; whether it is located in the skin, as in scabies; in the muscles, as in trichinosis; in the lymphatics, as in erysipelas; in the solid viscera, as in amœbic abscess of the liver; in the intestines, as in cholera; or in the blood, as in relapsing fever, the introduction and multiplication of the living infectious agent constitutes infection.

Having this definition in view, and in the light of recent additions to our knowledge, we now include among the infectious diseases many pathological conditions which a few years ago were not recognized as being due to infection; *e.g.*, tetanus, pneumonia, pleurisy, meningitis, etc. Indeed, the list of infectious diseases is constantly being increased, and an "idiopathic inflammation" of skin, mucous or serous membrane or visceral parenchyma is something which modern pathologists find it more and more difficult to believe in. It is true that we may have inflammation and pus-formation independently of living organisms, but only as the result of the direct action of certain irritant chemical agents, and such inflammation is certainly not idiopathic. Thus we may have a dermatitis from the local action of the poison of rhus toxicodendron; a gastritis may result from the introduction into the stomach of an irritant poison; a parenchymous nephritis may be due to toxic substances present in the blood circulating through the renal vessels, etc. Mechanical irritation alone does not give rise to suppurative inflammation, but it is a potent predisposing factor, inasmuch as bruised tissues are especially liable to infection. The stone in the

bladder or the surgeon's instrument introduced for its removal does not cause a cystitis, but the bacteria to which this is due would be impotent in the absence of any mechanical injury to the mucous membrane. It is not very many years since the peritoneum, the synovial membranes of the joints, and other serous membranes, were supposed to be especially liable to become inflamed as a result of laceration, exposure to the air, etc. But the experience of surgeons at the present day shows that such membranes may be freely exposed and roughly handled without any bad result, if infection is avoided by the employment of antiseptic or aseptic methods.

The tolerance of the peritoneum to mechanical irritation and the marked difference in the results of infection by the micro-organisms which cause peritonitis and of the introduction of finely pulverized glass into the peritoneal cavity is well illustrated by experiments which I made in 1884. In these experiments finely powdered, sterilized glass was introduced into the abdominal cavity of rabbits in amounts varying from four to eight grammes. In my report of these experiments I say:* "It was a matter of astonishment to me that such an amount of irritating material could be introduced into the peritoneal cavity of a delicate animal like the rabbit without producing fatal peritonitis." The inflammation which did occur was of a conservative kind and resulted in the formation of nodules of various sizes, from the head of a pin up to that of a bean, which consisted of connective tissue enclosing the angular fragments of glass. There were also "adhesions composed of newly formed connective tissue rich in cells and containing numerous small masses of glass enclosed in a capsule." The rabbits subjected to these experiments remained in good health and increased in weight up to

*The American Journal of the Medical Sciences, 1885, N. S., clxxvii p. 71.

the time that they were killed, at the end of two or three months, for the purpose of observing the local effects of the foreign material introduced into the peritoneal cavity. The result is similar when sterilized foreign bodies are introduced into the connective tissue, the muscles, or the solid viscera; the conservative inflammation which occurs is entirely local, is not attended with the formation of pus, and results in enclosing the foreign body in a fibrous capsule. But if our foreign body carries with it a few pyogenic bacteria, a localized infectious process is established, and we have the formation of an abscess; or, if the pyogenic bacteria are of a virulent variety, they may invade the blood and give rise to fatal septicæmia.

In traumatic infection the pathogenic micro-organism may be from an external source or from the surface of the body or of a mucous membrane of the infected individual, as is no doubt usually the case when suppuration occurs in operative wounds, etc. Autoinfection is also, without doubt, the rule in croupous pneumonia, in pleurisy, in meningitis, etc., the infectious agent being habitually present in the salivary secretions or elsewhere, and the localization and multiplication of this being due to other factors which are just as essential in the etiology of these and other diseases as is the specific infectious agent.

One of the objects in view in the present address is to call attention to these other factors. In the first place, it is evident that the pathogenic germ is impotent to produce disease in the absence of a susceptible individual, and we know that susceptibility to infection varies in different individuals and in the same individual at different times, and as a result of various circumstances. In general, depressing agencies, such as starvation, loss of blood, alcoholism, crowd-poisoning, etc., increase the predisposition to infection. It is for this reason that epidemics

so often go hand-in-hand with famine, that the victims of chronic alcoholism are so subject to pneumonia, to carbuncle, and other localized infectious processes, as well as to epidemic diseases; that puerperal women who have lost much blood are especially liable to septic infection, etc. In addition to the predisposition due to natural susceptibility, increased or otherwise by depressing agencies, another factor is in many cases essential for the establishment of a localized centre of infection. This is a direct exciting cause, such as mechanical violence to the tissues, the action of a chemical irritant, or a localized congestion from any cause and often reflex in its origin. We believe that the last-mentioned condition is very frequently the determining cause of a pneumonia, a pleurisy, a tonsillitis, or a meningitis; and also of a considerable proportion of the cases of diphtheria, influenza, Asiatic cholera, etc. It has been recently demonstrated that healthy persons may carry the bacillus of diphtheria in their throats for a considerable period without presenting any evidence of diphtheritic infection, and that during the prevalence of cholera the cholera spirillum is not infrequently found in the alvine discharges of persons who present no symptoms of the disease. These facts are quite in accord with what had previously been shown with reference to other pathogenic bacteria. The present writer carried the micrococcus of croupous pneumonia in his salivary secretions for years, and Netter has since demonstrated its presence in the saliva of 15 per cent. of the healthy individuals examined by him. Streptococci and staphylococci, capable of producing abscess-formation, or even general septic infection, may be carried upon the surface of the body, or of a mucous membrane, with impunity so long as the susceptibility of the individual is not below the normal and there is no local point of diminished resistance through which infection may occur. In like manner, we believe,

the influenza bacillus may effect a lodgment in the respiratory passages of healthy persons and remain for a longer or shorter time without producing an attack of the disease, which is liable to be developed, as in the case of pneumonia, tonsillitis, etc., as a result of exposure to cold —"catching cold." In Asiatic cholera the exciting cause of an attack, when the cholera spirillum is present in the intestine, may be exposure to cold, or more frequently a congestion of the mucous membrane due to undigested and irritating material in the primæ viæ. In the popular mind, in the absence of any exact knowledge of the specific infectious agent, the attack is usually ascribed to the exciting cause, and among physicians this was formerly considered a satisfactory explanation of the etiology of the diseases referred to. This view was supported by tables of seasonal prevalence, showing that pneumonia and influenza occur most frequently in the winter and spring; diarrhœal diseases in the summer, etc. In the light of our present knowledge it is evident that the exciting cause of an infectious disease is an etiological factor which would be inoperative in the presence of a specific infectious agent; but, on the other hand, the specific infectious agent is often impotent for evil in the absence of a direct exciting cause, and both will fail to produce disease in the absence of a natural or acquired predisposition or susceptibility. To illustrate: A tendency to tubercular infection is inherited by certain individuals; these individuals live in a locality where tubercle bacilli abound in the dust of their dwellings, in milk consumed as food, etc. In such individuals an injury to the knee or to the hip during youth is likely to give rise to tuberculous joint-affection. At the age of twenty to thirty years the tendency to pulmonary infection is more marked, and the predisposition is increased by any depressing agency, such as poor food, insanitary surroundings, a sedentary life, mental anxiety, etc. As a direct

exciting cause we may have the pulmonary congestion which results from taking cold (reflex), the irritant action of dust-particles or chemical vapors (as in certain manufacturing industries), or the devitalizing influence of other infectious processes (croupous pneumonia, bronchitis, etc.). In the case of Asiatic cholera predisposition probably also constitutes an important factor. Among individuals who are exposed under apparently identical conditions a certain number may suffer a fatal attack, others may have a slight choleraic diarrhœa, while others may escape entirely. It is difficult to determine, however, that in such a case the conditions favoring infection were identical; there may have been a difference in the reaction of the gastric juice; or a temporary indigestion, exposure to cold during the night, fatigue, or fear may have acted independently or in association as exciting causes and be directly responsible for the development of the attack. In diphtheria, again, we have a difference in susceptibility; the young, as a rule, having a greater predisposition to the disease than adults, and certain families appearing to be especially liable to it. This predisposition is probably intensified by any acute or chronic inflammation of the mucous membranes most exposed to infection; or, when the diphtheria bacillus has effected a lodgment upon the healthy mucous membrane, a reflex hyperæmia due to exposure—"catching cold"—may be the exciting cause of the attack.

The seasonal prevalence of certain diseases is due to the fact that the specific infectious agent multiplies external to the bodies of infected individuals when conditions as to temperature, moisture, and organic pabulum are favorable for such multiplication. The epidemic prevalence of yellow fever, of cholera, and of various forms of intestinal flux during the summer months and the autumnal epidemic of malarial fevers in regions favorable for

the development of the malarial parasite, are no doubt to be accounted for in this way. On the other hand, certain diseases, in which there is no evidence that the specific infectious agent is capable of multiplication outside of the bodies of infected individuals, are most prevalent in winter because conditions are then more favorable for their communication from individual to individual. This is true of those infectious diseases which are communicated by personal contact ("contagious diseases"), such as small-pox, measles, scarlet fever, whooping-cough, influenza, diphtheria, etc. Evidently conditions which bring those already infected in close personal contact with healthy individuals, at a time when doors and windows are closed to exclude the cold air, will favor the extension of these diseases. In cities a notable increase in the prevalence of diphtheria and scarlet fever has been observed when the public schools were opened in the autumn. The increased prevalence of influenza and diphtheria during the winter and spring is due not only to the influence of exposure to cold as a factor in developing an attack, but also to the intimate association of those already infected with healthy individuals. This occurs in schools, churches, factories, and private dwellings, and fully accounts for the rapid epidemic extension of influenza in towns and cities. It is somewhat remarkable that the extension of this disease from individual to individual, by personal contact, is not recognized by the public generally and is still denied by a considerable number of physicians. As a matter of fact, the specific infectious agent has been known since 1892, when it was discovered by Pfeiffer in the purulent bronchial secretions of influenza patients, where it is found in vast numbers. This secretion is just as much infectious material as is the false membrane of diphtheria or the contents of small-pox pustules—each being able to reproduce its kind when introduced into the body of a susceptible

individual. And if an influenza epidemic is developed more quickly than an epidemic of diphtheria or of small-pox, this is chiefly due to the fact that the period of incubation is short and that no quarantine precautions are taken. The influenza patient receives his friends while confined to his room, with an unconscious disregard of the fact that he is exposing them to an attack of the infectious disease from which he is suffering; and when able to go out he or she may be seen at theatres, teas, balls, dinners, and public gatherings of all kinds, naïvely announcing to friends that he is just recovering from a severe attack of the grippe, and from time to time coughing up a little bronchial mucus loaded with influenza bacilli.

It is not many years since a majority of the profession accepted the popular view that during epidemics the atmosphere becomes widely contaminated with the infectious element, and that infection usually results from the respiration of air contaminated in this way; also that such infected air might be wafted across continents or oceans without losing its infecting power. So recently as the meeting of the International Sanitary Conference at Rome, in 1885, this view was maintained by two of the English delegates as regards cholera—which, they contended, extends from its epidemic foci in India through the atmosphere quite independently of human intercourse or means of transportation. It is hardly necessary to call attention to the fact that it has now been repeatedly demonstrated by exact researches that the cholera spirillum is quickly destroyed by desiccation and exposure to sunlight, and that the idea of a cholera-infected atmosphere can no longer be entertained. We know from experience that even so persistent a poison as that of small-pox is not transmitted through the air in an effective condition to any considerable distance from an apartment containing small-pox patients. By desiccation, the germi-

cidal action of sunlight, and dilution, all known pathogenic bacteria quickly lose their infecting power, and it is surprising that any well-informed physician should entertain the vague and unscientific notions with reference to the epidemic prevalence of influenza which formerly passed current in attempts to explain epidemics of cholera, typhoid fever, typhus, etc.*

The inference, therefore, appears to be justified that the disease is contracted by respiring an infected atmosphere. But this inference may eventually turn out to be a mistaken one, although many facts could be given which seem to support it. It will be observed that in this case the supposed infection of the atmosphere is of limited extent and depends upon a continuous supply of the infectious elements from the telluric foci from which these are believed to be given off. The mode of infection, therefore, would correspond with that which occurs in the malarial fevers, when these are contracted by breathing the air from marshy places, and would give no support to the idea that the epidemic prevalence of such diseases as cholera, influenza, etc., may be due to a general contamination of the atmosphere of a town or of a section of country; or that there is any substantial basis for the "pandemic wave theory" which was advanced by some of the older writers upon epidemiology. There is a way by which pathogenic bacteria may be carried a limited distance through the air, and by which infectious material may be conveyed from house to house, from a privy vault to the beefsteak upon the kitchen table or into the milk-jug, which should not be lost sight of in considering channels of infection. This is upon the feet of insects, and especially of house-flies, which, as is well known, frequent all kinds of decomposing animal material and swarm upon the surface of fecal matter deposited upon the surface of

* A portion of the MS. is missing.

the ground or in shallow pits. There are many facts which support the view that such material affords a suitable nidus for the development of the yellow-fever germ, and I am strongly inclined to believe that the ubiquitous house-fly is a factor of considerable importance in the propagation of yellow fever, typhoid fever, and cholera.

Dr. Finlay, of Havana, some years ago conceived the idea that yellow fever is transmitted from the sick to susceptible individuals by mosquitoes. But his experiments do not give any support to his theory. He finds that the female mosquito, after filling itself with blood from a yellow-fever patient, will not again draw blood for about forty-eight hours, but that at the expiration of this time it will again fill itself if applied to another individual. Dr. Finlay reports that he "inoculated" eighty-seven persons by means of mosquitoes between June 30, 1881, and December 2, 1893. "All were white adults, uniting the conditions which justify the assumption that they were susceptible to yellow fever." Within a term of days, varying between five and twenty-five after the inoculation, one presented a mild albuminuric attack, and thirteen only "acclimation fevers." Inasmuch as seventy-three out of the eighty-seven individuals to whom the "contaminated mosquitoes" were applied presented no symptoms which could be ascribed to the so-called "inoculation," and as the one who presented "a mild albuminuric attack" and the thirteen who had "acclimation fevers" within twenty-five days after the application of the mosquito were exposed in Havana to the climatic conditions which give rise to such fevers in other susceptible individuals, I think we are justified in the statement that Dr. Finlay's experiments give no support to his theory.

It has also been suggested that the mosquito may give rise to malarial infection, by introducing the malarial germ through the puncture it makes for the purpose of obtain-

ing the blood of its victim. But I know of no exact observations or experimental evidence in support of this hypothesis. There are, however, some reasons for believing that the mosquito may play a part in the etiology of malaria in the way suggested by Manson—*i.e.*, as the agent by which the parasite is withdrawn from the blood of infected individuals and returned to its normal habitat outside of the body to complete its life-history. We have an analogy for this in the part played by the mosquito in withdrawing embryo filariæ from the blood and returning them to the stagnant pools frequented by the insect. Manson says, in discussing this hypothesis in his Gulstonian Lectures (1896):

"We can readily understand how the mosquito-bred plasmodium may be swallowed by man in water, as so many disease germs are, and we can readily understand how it may be inhaled in dust. Mosquito-haunted pools dry up. The plasmodia in the larvæ and those that have been scattered about in the water, finding themselves stranded by the drought, and so placed in a condition unfavorable for development, pass into a resting-stage, just as they do when by quinine or other means man is rendered temporarily unsuited for their active life. They may, probably do, become encysted, as so many of the protozoa do in similar circumstances. The dried sediment of the pool, blown about by winds and currents of air, is inhaled by man, and so the plasmodium may find its way back again to the host from whom its ancestors had, perhaps, started generations back."

This theory appears plausible, but we find it difficult to believe that man is essential for the completion of the life-cycle of the plasmodium, for the most concentrated and deadly malarial emanations may be given off from marshy places which are far removed from the haunts of man. It may be, however, that the mosquito is an es-

sential factor in the development of the plasmodium, and that man, instead of being a necessary intermediate host, only serves occasionally and in a certain sense accidentally as such. Perhaps other mammals or birds may serve the same purpose. It has frequently occurred to the writer that the malarial plasmodium, like other amœboid protozoa, may find its normal habitat, external to the bodies of its insect or animal hosts, upon the stems and leaves of water plants, rather than in the water itself. The fact that malarial fevers do not prevail in the vicinity of swamps when the marsh vegetation is submerged by high water, is in favor of this view, as is also its apparent need of plenty of oxygen, which we infer from its active multiplication in the blood and its parasitic invasion of the red blood corpuscles.

The transmission of infectious diseases by insects appears to be well established in the case of Texas fever of cattle and of the fatal African epizoötic known as the "fly disease." In the first-mentioned disease, which has been shown by Theobald Smith to be due to a minute blood parasite which invades the red corpuscles, the tick is the intermediate host. The ticks which fall from the infected animals give birth to a numerous progeny in the pastures frequented by them, and these young ticks attach themselves to other animals which subsequently feed in the same pastures and transmit to them the fatal infection.

The African fly disease is fatal to the ox, the horse, the dog, the sheep, and the ass, but not to the indigenous wild animals in the region infested by the tsetse fly. The recent researches of Bruce indicate that the fly acts as a carrier of the infectious agent from diseased to healthy animals. In the blood of infected animals Bruce finds a flagellated micro-organism similar to the protozoön, which is recognized as the cause of the so-called "surra disease" of India—Trypanosma evansi. After feeding on the blood

of an infected animal the tsetse fly can communicate the disease to a healthy animal by its bite. After a short period of incubation the hæmatozoa appear in the blood concurrently with the development of fever and followed by rapidly progressive anæmia, dropsy, etc. That anthrax, streptococcus infection, etc., may be transmitted by flies which have been in contact with infectious material and subsequently alight upon an open wound, sometimes of the most trifling character, appears to be well established.

The essential factors in the etiology of an infectious disease, as already indicated, are a susceptible individual and a specific infectious agent capable of reproduction in the body of such individual. Both of these factors are subject to very considerable variation; individuals in degree of susceptibility, and the specific infectious agent in pathogenic potency. And it is evident that when one factor is diminished the other must be increased to produce a positive result. Thus infection may occur as the result of the introduction into the body of a very susceptible individual of a micro-organism the pathogenic potency of which is greatly attenuated; or an individual with but little susceptibility may succumb to an infection resulting from the introduction of a virulent variety of the same micro-organism. The experiments of bacteriologists show that the known pathogenic bacteria vary greatly in pathogenic potency when obtained directly from the blood or tissues of infected individuals, and that a still greater difference occurs when they lead a saprophytic existence, either in artificial culture-media or under conditions found in nature. Also that, in many instances at least, infection depends not only upon the pathogenic potency of the germ, but upon the introduction into a susceptible individual of a certain number, the quantity required bearing an inverse ratio to the pathogenic virulence. These facts have thrown a flood of light upon epidemiology and upon

clinical medicine. We now recognize the fact that where the susceptibility to infection is slight, or the specific infectious agent more or less attenuated, we may have a mild attack which fails to present all of the characteristic symptoms of a typical severe attack as described in textbooks of medicine. Thus we may have sore throats which are true diphtheria, although the characteristic false membrane is absent; we may have typhoid infection without diarrhœa or delirium, or rose-spots upon the abdomen; we may have malarial infection without the characteristic periodic paroxysms of fever; we may have yellow fever without albuminous urine, or black vomit, or a yellow skin. In short, we can no longer permit our diagnosis to rest solely upon a clinical picture drawn from the severe and fatal cases of an infectious disease. As a matter of fact, this clinical picture not infrequently includes something more than the symptoms due to the specific infectious process to which we give the name diphtheria, or pulmonary tuberculosis, or scarlet fever, etc. The most prominent and fatal symptoms may be due to a secondary infection by a different pathogenic micro-organism. The so-called "practical physician," who rejects the aid of the bacteriologist and insists that the diagnosis must rest upon the clinical features of a case, is not only at a disadvantage in the early diagnosis of his cases of certain infectious diseases and in the recognition of the specific character of mild and atypical attacks, but he is liable to the mistaken assumption that symptoms observed are essential features of a disease when they are in reality due to a secondary infection.

My discussion of the classification of infectious diseases is undertaken without any expectation of offering at the present time a satisfactory scientific classification, but rather as showing the difficulties attending such an attempt in the present state of knowledge. That a scientific

classification of diseases should be based upon etiology is generally admitted, and we have to-day a great advantage over our predecessors as regards the data for such a classification. Still, our knowledge is incomplete in many directions, and we are yet in doubt as to whether certain diseases should be included among the infectious diseases or not. The tendency of modern science has been, however, to add constantly to the list of diseases of this class. It is less than fifteen years since Koch published his discovery of the tubercle-bacillus; the tetanus-bacillus was discovered in 1884; the bacillus of influenza in 1892. To-day we are discussing the propriety of transferring acute rheumatism to the list of infectious diseases. To-morrow we may be able to include cancer in all its varieties.

As illustrating the rapid development of our knowledge and the consequent additions to the list of infectious diseases, I venture to quote from the recent important work of Unna, on "The Histopathology of Diseases of the Skin":

"The infectious inflammations of the skin form a comprehensive group, not only the richest in types of all groups, but also the one which, by the discovery of new infectious agents and the recognition of the infectious nature of diseases previously considered not infectious, is from day to day steadily increasing in extent. It falls naturally into two divisions: that of the acute exanthems, in which the exanthem is only one symptom of the acute general disease, and that of the local cutaneous infections.

"Before considering the individual members of this great group, it must be stated that in any arrangement only the clinical and histological facts can be utilized, for of the etiology, the active infective cause, our knowledge is too deficient, and in particular too unequal. Only of a few of these infections can it be said that our etiological knowledge is as complete as our anatomical and clinical, as, for example, in tuberculosis, impetigo staphylogenes,

trichophytosis, scabies, erysipelas. In other certainly not less infectious processes—*e.g.*, syphilis, Aleppo boil, impetigo-contagiosa, we have scarcely or not at all the first rudiments of etiological knowledge. In others we have noteworthy commencements of a better knowledge; but they still require confirmation from other investigators, as in eczema, psoriasis, erysipeloid, acne varioliformis, ecthyma, ulcus molle. Other processes are so nearly comparable to better known infectious skin diseases that, without etiological recognition, their provisional installation is justified—*e.g.*, tinea imbricata, impetigo, herpetiformis, parakeratosis scutularis, lichen planus, pemphigus acutus benignus, folliculitis (Lukasiewicz), spiradenitis, the so-called pemphigus vegetans, etc. Finally, there are some, of which the etiology appears to be already determined by certain investigators, but is generally contradicted, as in the psorospermosis of Darier and in vaccinia.

"It will therefore not appear strange if, supported by purely anatomical and clinical grounds, we rank here a series of skin diseases whose infectivity is as yet partly not suspected, partly denied, and as yet not certainly determined, in the sure hope that the future will establish their position, as it has done for so many other affections in the last ten years. As such, for example, I regard pityriasis rubra (Hebra), pityriasis rubra pilaris, pemphigus chronicus, acne, and ichthyosis. The justification of this will appear, partly from their histological peculiarities, as these are described, and partly from the clinical relations, which here are only suggested."

It must be remembered that an infectious skin disease is not necessarily contagious, because in many cases the infectious process depends upon individual predisposition and local exciting causes, which are essential factors in the development of disease.

If we turn from diseases of the skin to acute and

chronic inflammations of mucous membranes, we shall find that when these are not due to the direct action of chemical irritants they are almost certainly the result of a localized infection. This is probably true of chronic conjunctivitis in all its forms, of chronic nasal catarrh, pharyngitis, laryngitis, bronchitis, enteritis, endometritis, cystitis, etc. We may have a temporary congestion of a mucous membrane as a reflex phenomenon due to exposure to cold, or as the direct result of the action of a chemical or mechanical irritant; but when an acute or chronic suppurative inflammation follows, it is probably due to the presence of pathogenic micro-organisms of one kind or another. A grain of sand in the eye will quickly give rise to hyperæmia of the conjunctiva, which soon subsides when the mechanical irritant is removed. If it is not removed, a conjunctivitis may be developed as a result of the presence of pyogenic micrococci. We have, in fact, a traumatic infection. The same thing occurs in cystitis, except that in this case the infecting micro-organisms must be introduced from without, as they are not habitually present in the healthy bladder. The traumatism and the introduction of the pathogenic bacteria to which the cystitis is due no doubt result, in a large proportion of the cases, from the introduction of instruments into the bladder for purposes of exploration, etc. Endometritis, following a miscarriage or an operative procedure of any kind, and puerperal infection may also be regarded as traumatic infections.

Unna says in the recent work from which we have already quoted: "The more we have learned of the infectious agents in all inflammations of external wounds, the more has the number of simple traumatic inflammations decreased. Possibly the intertriginous inflammations, the ingrowing nail, are only circulatory disturbances until some external infection makes the process inflammatory."

We think this is not only possible, but extremely probable, and in the near future it is likely to become a settled conviction based upon experimental evidence.

This brings us to speak of a classification based upon the mode or channel of infection. From this point of view we may have: (*a*) Traumatic infections; (*b*) infection by contact (direct contagion); (*c*) infection through ingesta; (*d*) infection through the respiratory tract. Under the heading "infection by contact" (*b*), we would have to include venereal diseases and contagious skin diseases. To what extent the eruptive fevers are contagious in this sense it is difficult to say. To transmit small-pox or vaccinia by way of the skin a traumatism is considered necessary—vaccination or inoculation; and it is probable that infection in the eruptive fevers usually occurs through the deposit of infectious material suspended in the air upon the respiratory mucous membrane, rather than through the unbroken skin. Scarlet fever and measles may also be transmitted by inoculation, and there is ample evidence that the first-mentioned disease may be transmitted through ingesta, especially milk. Typhoid fever, cholera, amœbic dysentery, cholera infantum, trichinosis, etc., are contracted by the introduction into the alimentary tract of ingesta containing the infectious elements to which they are due. Diphtheria, epidemic influenza, mumps, whooping-cough, measles, and pulmonary tuberculosis are probably contracted through the deposit upon the respiratory mucous membrane of the specific infectious elements to which they are due. Pneumonia, pleurisy, peritonitis, meningitis, bronchitis, and suppurative traumatic infections generally are due to micro-organisms which habitually lead a saprophytic existence upon the surface of the body or upon exposed mucous membranes; they are therefore commonly due to autoinfection.

Another method of classification which presents cer-

tain advantages is one based upon the nature of the infectious agent. This would give us the following principal groups:

I. Diseases due to infection by vegetable parasites: (*a*) Schitzomycetes (bacteria); (*b*) hyphomycetes (microscopic fungi); (*c*) blastomycetes (yeasts).

II. Diseases due to infection by animal parasites: (*a*) Protozoa; (*b*) nematodes; (*c*) trematodes; (*d*) cestodes; (*e*) acari.*

Since the discovery of the tubercle-bacillus and the introduction of Koch's methods for the isolation and cultivation of bacteria by means of solid culture-media, the progress of our knowledge relating to the bacteria (Group I., *a*) has been very rapid, and while we have still, no doubt, much to learn about pathogenic bacteria, it is probable that few if any first-class discoveries in the etiology of infectious diseases remain for the bacteriologists. The infectious diseases due to micro-organisms of this class may be classified as follows: (*a*) General blood infections, including relapsing fever, anthrax, septicæmia of cattle (Rinderseuche), etc.; (*b*) localized infections, acute or chronic, including erysipelas, diphtheria, influenza, croupous pneumonia, bronchitis(?), gonorrhœa, cystitis, pyelonephritis, endometritis, conjunctivitis, otitis, ozæna, pleurisy, peritonitis, pericarditis, meningitis, endocarditis, abscesses, furuncles, adenitis, mastitis, osteomyelitis, enteritis(?), Asiatic cholera, cholera nostras, cholera infantum, non-amœbic dysentery(?), typhoid fever, tuberculosis, glanders, rhinoscleroma, bubonic plague, chancroid, tetanus, malignant œdema, etc.

The second group (*b*) of infectious diseases due to vege-

* In this classification we do not take into account the animal parasites which infest the hair and the surface of the body (pediculi), or the ticks, "harvest bugs" (Leptus autumnalis), and "jiggers" (Pulex penetrans), which bury themselves in the skin either completely or partially.

table parasites includes: Actinomycosis, mycetoma or Madura foot, the various forms of tinea (trichophyton, imbricata, vesicolor, favosa), erythrasma, pinta (the spotted skin disease of Mexico), etc.

Recent researches indicate that the blastomycetes (*c*) may, perhaps, play a more important rôle in animal pathology than has been heretofore suspected. Busse, in 1895, obtained from a case of chronic pyæmia a yeast which proved to be pathogenic for mice, and during the past two years several investigators (Sanfelice, Kehane, Curtis, Corselli, Frisco, Pianese, Roncali) have obtained pathogenic blastomycetes, by cultivation, from malignant tumors. Oidium albicans, which is recognized as the usual cause of aphthous ulcers in the mouth, belongs to this group.

In the second group (II.), which includes infectious diseases due to animal parasites, especial interest attaches to the subgroup (*a*) protozoa. The diseases which have been shown with a great degree of probability to belong to this group are the malarial fevers, amœbic dysentery, the surra cattle disease of India, the tsetse "fly disease" of Africa, and the "Texas fever" of American cattle. But these, I anticipate, are the only first discoveries in a very promising but difficult field of investigation. The presence of a ciliated amœboid micro-organism in the mucous secretion coughed up by children suffering from whooping-cough has recently been reported by Deichler (1886) and by Kourlow (1886).

The rapid progress of our knowledge of the bacteria has been due to the fact that satisfactory methods (staining) have been devised for detecting these minute micro-organisms in the blood and tissues of infected individuals and for cultivating them in artificial media. Unfortunately, these methods have only a limited utility when applied to investigations relating to the protozoa. The bacterial

cell has considerable stability, owing to its cellulose envelope (cell-wall), and it is readily stained by the aniline dyes. The protozoa, on the contrary, very readily undergo disintegration, and the more fluid protoplasm of these unicellular organisms is not so easy to demonstrate by the usual staining reagents. It has also been found very difficult, and in many cases quite impossible, to obtain pure cultures in artificial media. Again, the recognition of protozoa in the blood of infected animals by means of the microscope requires special skill in making preparations, in the management of the light, etc., and expert knowledge of the normal elements of the blood and of the changes they undergo as a result of various methods of preparation. This is illustrated by the fact that many persons more or less familiar with the use of the microscope have failed to discover the malarial parasite in the blood which undoubtedly contained it, while others have evidently mistaken vacuoles in normal blood corpuscles for the plasmodium, the crenated red corpuscles for pigmented cells, and deformed corpuscles for malarial crescents.

Notwithstanding the painstaking researches which have been made during the past few years for the purpose of determining the nature of certain bodies which may be demonstrated by special staining methods in the cells of carcinomatous tumors, we are still uncertain as to the nature and etiological import of these bodies. Some investigators believe them to be protozoa, and from their location infer that they are the specific etiological agents in the development of malignant growths of this character. But, so far as we are informed, this view has not as yet received any very substantial support, and has not been accepted by the leading pathologists of the world.

The presence of amœboid micro-organisms in the contents of the pustules of variola and in vaccine lymph has been reported by several investigators—Guarnieri (1892),

Monti (1894), Piana and Galli-Valerio (1894), L. Pfeiffer (1894), Clarke (1895), v. Sicherer (1895), E. Pfeiffer (1895). Guarnieri, in 1892, published a paper in which he claimed to have cultivated the amœboid micro-organism found by him in vaccine lymph by successive inoculations in the corneæ of rabbits. E. Pfeiffer has since (1895) confirmed this observation, and has seen the parasite undergoing amœboid movements and in process of multiplication by spontaneous fission. During the past two years investigations relating to the etiology of vaccinia and variola have been made at the Army Medical Museum in Washington, by Major Walter Reed, Surgeon, U. S. A. These investigations show that in vaccinated monkeys and in children an amœboid parasite makes its appearance in the blood on the sixth or seventh day after vaccination, and may be found during a period of from five to seven days, when it disappears. Reed has found the same parasite in the blood of patients with variola and in his own blood after an accidental vaccination in the finger. The parasites are not numerous. They are less than a third the diameter of a red blood corpuscle, and may be observed to undergo amœboid movements in a drop of blood, properly mounted for microscopical examination, during a period of twenty-four hours or more. These amœboid bodies, like the malarial parasite, would be easily overlooked by one not an expert in blood examinations. This is the first public announcement of the results of Dr. Reed's extended and interesting observations, full details of which will be given by himself in a paper to be published hereafter.

Finally, we may base our classification upon the special tissues or organs involved in the infectious process. From this point of view we have:

I. General blood infections (septicæmia), including malarial infection, relapsing fever, streptococcus infection, etc., in man; and anthrax, swine-plague, cattle-plague

(Rinderpest), Texas fever of cattle, etc., in the domestic animals.

II. Localized infections: (*a*) Of the integument and subcutaneous connective tissue, including scabies, the dermatophyti, erysipelas, furuncles, etc.; (*b*) of mucous membranes, including diphtheria, influenza, glanders, bronchitis, rhinitis, conjunctivitis, otitis, gonorrhœa, cystitis, enteritis(?), cholera Asiatica, cholera nostras, etc.; (*c*) of serous membranes, including pleuritis, pericarditis, peritonitis, meningitis, and synovitis; (*d*) of glands, including typhoid fever, bubonic plague, parotitis, mastitis, adenitis, etc.; (*e*) of the lungs, including pulmonary tuberculosis, croupous pneumonia, etc.

It is evident that under several of the subdivisions the diseases mentioned would require a subheading to designate definitely the nature of the infectious process. Thus we would have, for example, to specify whether a peritonitis was tubercular or due to streptococcus infection or to some other known micro-organism; an adenitis might be due to syphilitic or tubercular infection or to one of the pus-cocci; a conjunctivitis to gonococcus infection or to some other pathogenic micro-organism, etc.

It will be noted that, both in our classification based upon the nature of the infectious agent and in that based upon the special tissues or organs involved in the infectious process, we have not included the eruptive fevers. It is hardly necessary to say that this omission is due to the fact that we have as yet no positive knowledge to guide us in placing these infectious diseases in the systems of classification suggested, which are, therefore, necessarily incomplete.

THE EVOLUTION OF THE SURGERY OF THE TWENTIETH CENTURY.

ANNIVERSARY ADDRESS, NOVEMBER 19, 1896.

BY GEORGE R. FOWLER, M.D.,

OF BROOKLYN, N. Y.

"The law is continuity, the watchword progress, the worker evolution."—PROFESSOR JOHN CHIENE, M.D.

In availing myself of the privilege of appearing before you this evening, I desire to express my acknowledgments to the President for his invitation to deliver the anniversary address on behalf of the time-honored body of which I am proud to be an humble member, and to promise you, in return for the assurance which I see in your faces that you will listen with patience to what must be an old story to most of you, and, perhaps, will prove to be a prolix one to the remainder, that I shall endeavor so to clothe my subject as to make it appear more than a mere recital of facts, a catalogue of events, a list of names, or a stilted declamation of so-called brilliant surgical exploits.

It is my purpose to consider particularly those events which stand out prominently before all others in their relation to the advances made in the science and art of surgery during the present century.

Material progress, however valuable, is but a symptom of mental development. This is just as true of medical science as of science in general, of which latter, in truth, we only just realize that we are but a part. We are but one of the spokes in the wheel of progress, and the condi-

tions of development within our own workshop do not differ materially from those which obtain in the world of work at large. Little things, or what appear to be but insignificant events, gradually assume great importance, and that in direct proportion as they are of a character to enlarge our ideas and broaden our views; take, for example, the incident of the apple falling from the tree at the feet of Newton. The little ripple of thought thus set in motion in the pool of the philosopher's mind evolved into a wave, which gathered force as it rolled on until no man may say where its influence shall end. From this trifling incident arose a train of philosophic thought whose far-reaching effects have extended into the celestial spaces by establishing a physical law, to which the entire planetary system is as subject as the most insignificant object upon the earth's surface.

Looking back over the cultivated fields of the century, where the toilers of the soil of science have labored, how rich the harvest seems! And yet not all has even blossomed, much less come to fruition. The seed of original thought is being plenteously sown, and the graft of improvement implanted upon older stock. Here and there one discerns a constantly broadening area of exceptionally rich intellectual development, whose thought-nucleus glistens and sparkles like a jewel of great worth, as, indeed, it is. In the field of the healing art animal experimentation, anæsthesia, antisepsis, and asepsis, and the discovery of the Röntgen rays, are to surgery what Newton's discovery of the law of the attraction of gravitation was to astronomy, Priestley and Scheele's discovery of oxygen to chemistry, and Darwin's discovery of the law of selection to evolution. From each of these, as a central idea, have grown out constantly widening furrow-lines of both intellectual evolution and physical development.

EXPERIMENTATION UPON LOWER ANIMALS.

The emblem "Truth" has ever been written upon the banner of the soldier of science. In the words of our lamented Loomis: "The scientific experimenter alone adds to our store of knowledge and power for good. He seeks for truth, and truth alone. However isolated or unrelated his results may seem, he sees in each a potential value. The most insignificant discovery thus not only has its peculiar merit, but points the way to other hidden truths, although it may often be difficult to connect the several links in the long chain of progressive knowledge."* This sounds the key-note of all the important advances made in surgical science during the century. The spirit of original research is one of the most precious heritages of the healing art. But it is particularly during the past century that the results obtained from experimentation have been of the greatest value to surgery, although the intellectual evolution which led up to these results has been going on for centuries.

The fear of a fatal result from hemorrhage exercised a deterrent effect upon the operative efforts of the earlier surgeons, and at the present day this fear has a most healthful influence in preventing pretenders from performing surgical operations. Like a soldier under the enemy's fire, the surgeon, by his behavior in the presence of a severe hemorrhage, soon announces what qualities he possesses to entitle him to respect. As Senn has truly said: "Skilful treatment of hemorrhage is an infallible criterion of good surgery."† Loss of blood is the regular accompaniment of all major operations, and may complicate what at the outset was the most trivial procedure. It is no wonder, therefore, that the earliest practitioners of our

* Presidential address of A. L. Loomis, M.D., LL.D., third meeting of the Congress of American Physicians.

† "Experimental Surgery."

art should have turned their attention to this most important subject; the evolution of the aseptic animal ligature is an outcome of this early demand for protection against the dangers of surgical hemorrhage.

The first application of the ligature for the prevention of hemorrhage was the result of an instinct rather than of reasoning. Naturally enough, this instinct found its first expression in the arrest of the bleeding resulting from severing the umbilical cord in the new-born. The first account of such application dates back to 1500 B.C., although it is more than probable that this was the very first bit of technic that was developed in what was afterward to become the science and art of surgery, although writers in general allude to Hippocrates as the discoverer of ligature. Through the centuries that have elapsed since the human maternal instinct first impelled the encircling of the navel string by perhaps a twisted bit of bark or flax, or a lock of hair plucked from the mother's head, the history of the ligature has been the history of surgery.

It would be impossible to overestimate the force of the moral obligation which impels the surgeon to make sure, in every step of his work, that his actions bear upon their face the deep and lasting impress of honest effort. This obligation demands of him that all attainable knowledge bearing upon his work shall be at his command. Much of this knowledge must be obtained by experimentation, and every instinct of humanity demands that the subjects of this experimentation shall not be his fellow-man, but rather those lower in the scale of animal life than himself. It was this moral obligation that impelled Hunter, near the close of the last century, to experiment upon dogs with the view of discovering the reasons for the frequency of secondary hemorrhage following the application of the ligature for the cure of aneurism, and it was this experimentation which developed the fact that in-

juries to arteries underwent ready repair when the vessels were healthy, and that it was only when diseased conditions were present, or arose, that ulceration and secondary hemorrhage took place. Hunter's enthusiasm was unbounded, and his love of truth so great that his death was directly due to a burst of righteous, yet passionate, indignation, when his word was doubted. He recognized that great benefits were to be derived from experimentation upon the lower animals. Not only were vast results obtained by his indefatigable labors; he furnished the stimulus for those who were to follow, and awakened a generous rivalry in other workers by his example. These followed up his work by confirming the results of his experiments, as well as instituting new ones.

At the beginning of the present century much yet remained to be learned of the behavior of the blood-vessels under the application of the ligature. An alarming mortality from secondary hemorrhage confronted the surgeon. Pre-existing disease of the vessels could not account for this in all cases. In 1802 there appeared a most important publication by J. F. D. Jones, an English surgeon. Jones followed up the spirit of Hunter's inquiry by means of experiments upon animals, and made a most important addition to our knowledge of the processes employed by nature in suppressing hemorrhage from divided and punctured arteries. He showed that the effusion of lymph from the wound inflicted upon the artery by the ligature was sufficient, even if the ligature were removed at once, to obstruct the vessel; that the formation of a thrombus was not necessary to a complete obliteration of the latter; and, what is of great importance in the light of subsequent developments, he first directed attention to the deleterious effects of suppuration upon the processes of cicatrization in the blood-vessels.

Jones's momentary application of the ligature, however,

proved to be unsafe, although its occasional success showed his experiments to be of the utmost importance. At this point the work was taken up by Travers (1813), who, still by means of experiments upon animals, made another stride in the march of progress. The same processes of intellectual evolution were still at work, and new light came from a repetition and extension of Jones's experiments. Travers substituted the temporary for the momentary ligature, and showed that the fears of the older surgeons concerning the dangers of too tightly constricting the artery, which led them to include bits of cork, or a roll of lint in the ligature, in order to prevent erosion of the vessel, were groundless. The great difficulty of determining the earliest possible moment when the ligature could be safely removed proved to be a complex problem, with all the unknown quantities concerned in the processes of healing entering into the consideration. To remove it too early meant disaster from hemorrhage, and to leave it on too long was but to invite suppuration, and possible ulceration of the vessel-wall. Moreover, the manipulation necessary for the removal of the ligature seriously interfered with the prompt healing of the wound. In the following year (1814), Lawrence advocated cutting off the ends of the silk ligature, which theretofore had been left long and hanging in the wound to facilitate removal, and burying in the depths of the wound the loop of thread encircling the artery. The credit for this, however, has been claimed for Haire, of Essex (1786). Following this came the use of animal ligatures—chamois-skin by Physick, catgut by Cooper, tendons by Paul Eve, human hair by Porta, and the successful use of metallic ligatures of various kinds by Levert. These latter were always cut short and allowed to remain permanently in the wound.

Slowly, but surely, the goal was being reached; but

progress came exclusively along the line of accurate observation, and almost entirely upon the basis of experimentation upon animals. Finally the dark clouds of uncertainty cleared away and the clear, bright sunshine of established truth burst forth. The aseptic animal ligature was evolved as a part of Lister's wonderful achievement. The object of the search of the best minds in surgery for centuries was at last found. A ligature had developed which will fulfil all the purposes of hemostasis with certainty and safety, inflict the minimum amount of traumatism, produce the least amount of irritation—serving its purpose pending the completion of the healing process, yet finally disappearing by absorption and substitution when its office has ceased.

Another striking instance of the value to surgery of definite results, derived from experimentation upon animals, is shown in the advances made in our knowledge of processes of repair in osseous structures. The developments in this field alone have been of incalculable benefit to mankind. Duhamel's theory that the growth of bones takes place by an extension of their parts was far from satisfactory to Hunter. He therefore (1772) carried out his classical experiments upon the growth of bone by feeding pigs upon *Rubia tinctorum*, or madder, which has the property of coloring that portion of the bone which develops during the time the animal is fed upon the plant. By means of these and the additional experiments of embedding foreign bodies (shot) in the long bones of animals, at fixed distances from each other, he proved that Duhamel was in error, and that the growth of bones was accomplished by the addition of nutritious material and the simultaneous removal of old bone, the osseous structure in this way maintaining its form and the proper relation of its parts. Howship (1817) followed up this work, and by a series of experiments upon rabbits, made a most

valuable contribution to the then existing knowledge of the processes of repair in fractures. He observed the effusion of blood in the neighborhood of the injury, the changes which this undergoes, the fact that it is the medium in which the ossific reparative processes are carried on, the imperative necessity for firm fixation in order that these be not interfered with, and the circumstances governing the quantity and seat of the ossific deposit. In 1836 the work was taken up by Syme, and in 1837 by Heine; in 1844 by Flourens, and later (1858-1863) by Ollier's classical observations and contributions to the physiology and surgery of the osseous system, particularly the osteogenetic properties of the periosteum.

In fact, commencing with Hunter's classical experiments in 1772, almost the entire knowledge of bone surgery at our disposal to-day has been worked out upon the lines first laid down by that great surgeon and those who came after him, including Hofmokl's studies upon the histology of bone during fetal life, and the observation that during the development of bone cartilage-cells are transformed into bone-cells (1874); Kassowitz's observations upon the deposit of early matter in the fibrillary reticulum (1879); Regal and Vignal's experimental researches, which showed that irritation of the periosteum resulted in the production of new bone from the medullary tissue beneath, without passing through the stage of cartilage, and the additional fact, that if the periosteum is destroyed its place is supplied by a connective-tissue cicatrix which resembles the periosteum and supplies its place in case fracture is subsequently produced at the site of the former periosteal defect (1883); Kosmowski's observations upon the methods of repair in fractures of the skull, in which it is shown that to the osteogenetic properties of the medullary tissue are due the reparative processes

in general, and the union of loose splinters of bone in particular; and P. Bruns's experiments upon autotransplantation of marrow which showed that formation of bone takes place from pre-existing osteoblasts in the marrow, a result which constitutes, according to Senn, a potent argument in favor of renewed efforts to obtain bony union in intracapsular fractures of the neck of the femur. Time will not permit me even to mention the names, much less dwell upon the labors of all those who have materially contributed to our store of information, by experiments upon animals in this most important branch of surgical science and art.

Nor will time permit more than a passing reference to these researches commencing with Galen's experiments upon the alimentary canal, and continuing through the intervening centuries until their fullest fructification was reached by the labors of that grand exponent of surgical truth, Nicholas Senn. Who does not know of the wonderful achievements of this man in intestinal surgery alone? Achievements that were made possible by that same development of moral and intellectual force which circles around and has evolved from that which has existed since the very beginning of man's need of aid from man. This precept has possessed the same cogency through all time and remains the golden rule of to-day! Nor can I more than allude to those truths that have been snatched from depths which have been deemed as unfathomable as the mystery of life itself, and that bid fair to rob tetanus of its terrors, hydrophobia of its horrors, and septicæmia, in its various forms, of its thousands of victims yearly. Even that God-given boon, anæsthesia, as I shall show further on, was evolved, in its final and consummate triumph, upon the basis of animal experimentation. With truth and love of fellow-man as the aim and object, the imponderable forces of moral and intellectual development the motive

power, and animal experimentation the means, the march of progress has gone steadily on, and will go on in spite of those who would block the wheels of science by prohibitory laws, the result of a mistaken philanthropy and a misguided enthusiasm.

ANÆSTHESIA.

The thought-nucleus of anæsthesia is found in the gradual evolution of the nervous system of man to its present high development. Around this cluster efforts at self-preservation and the instinct of protection against, and relief from, pain. Through countless ages the struggle went on, and with increased sensitiveness to external impressions came increased demand for means to assuage the pangs of injuries inflicted during combats with those natural foes encountered in the struggle for existence. With the evolution of powers of reasoning this instinct became fully developed, and it is possible for us to believe that methods of accomplishing the relief of pain, more or less completely, were known to the wandering tribes centuries before Abraham came down into Egypt, and are now among the lost arts.

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In Morton's discovery of anæsthesia can be discerned the effects of that intellectual evolution which made possible the development of this aid to the surgeon's art. In the world of science there had already dawned a realization of the importance of untrammelled inquiry and the necessity for sound methods of investigation by experimentation, which should admit of verification at every stage of the process.

Of secondary interest is the story of the discovery of the anæsthetic properties of chloroform. Flourens, the French physiologist, in 1847 related before the Academy

of Sciences, how, after employing hydrochloric ether for purposes of anæsthesia, he was led to experiment with chloroform, a substance closely allied to chloric ether. He was completely successful in anæsthetizing animals during the otherwise most painful physiological experiments. About this time a student of Dr. John Bell, Furnell by name, who, subsequent to the announcement of the anæsthetic effects of this agent, had been in the habit of inhaling ether, and from whom Bell, for fear that the young man would do himself some harm, had hidden the ether bottle, suggested to Mr. Holmes Coote the use of chloroform, a bottle of which he had found and experimented with upon himself while searching his master's medicine-chest for the missing ether-bottle. Dr. Bell seems to have learned of this accidental discovery of the properties of chloroform by his student, and to have imparted the knowledge to Waldie, the Liverpool druggist. It was upon a suggestion from the latter that Simpson made trial of this agent and soon satisfied himself of its valuable properties.

ANTISEPSIS AND ASEPSIS.

The discovery of anæsthesia, marking, as it does, one era of the century now drawing rapidly to a close, stood out like a beacon-light and shone alone, albeit with a glorious effulgence, for a score of years, until the modest Scotch surgeon, Lister, wrenched another great secret from the rock of hiding of great truths, which awaited but the rod of such a Moses to bring it forth. The little spark first kindled in the wards of the Royal Infirmary at Glasgow, although at first almost quenched in the pitiless rainfall of ridicule, has survived and furnished the stimulus for other workers, and now stands glowing forth, casting its brightness upon a heretofore dark and unexplored

ocean's waste, and lighting the way for other explorers.* Doubted and otherwise contemptuously treated by his own countrymen at first, with the exception of Jenner, no discoverer of modern times has had more to contend with in the attempt to place truth upon a certain foundation than Lister. The struggle, however, was a short one. Ere long the processes of evolution of the human mind, which had been at work slowly, but surely, since the days of such giant minds as Galileo and Newton, came to his aid. Without regard to the special details of Lister's method, the underlying principle was soon recognized with that unerring instinct which places first in importance any suggestion which broadens our thought as to the possibilities, however remote, of a new grasp upon the processes of nature, and the application of knowledge thus gained to the needs of the human race.

Without detracting in the slightest from the glory of Lister's achievement, it is but fair to say that this was but the application of a principle, that of germ-growth, which was then in the process of development, to the solution of a problem that was uppermost in the minds of other workers. The peculiar conditions under which micro-organisms proliferate being known, it was but a step further to the suggestion that these possessed irritating properties when brought in contact with tissues whose vital resistance had been lowered by the infliction of an injury. That the relation of germ-infection to wound diseases did not first occur to Pasteur, is only to be explained upon the assumption that the evolutionary changes in the mind of the latter stopped short at the stage of the application of the germ theory of disease to locally favora-

* "On a New Method of Treating Compound Fracture, Abscess, Etc., with Observations on the Conditions of Suppuration," by Joseph Lister, Esq., F.R.S., Professor of Surgery in the University of Glasgow, *The Lancet*, March 16, 23, and 30, 1867, pp. 326, 357, 387.

ble conditions in the human body. His mental vision had grasped in succession the catalysis of Berzelius, the relation of fermentative processes to the growth of mould-fungi, the dependence of certain epidemic diseases in lower animals upon micro-organisms of similar origin, and the possibilities of the laws of susceptibility and immunity. Here, however, his work, so far as it relates to surgical diseases, ceases, and at this point it is taken up by Lister. It is but the repetition of "the spectacle so often witnessed in the history of science of a brilliant discoverer travelling in triumph along some new path, but stopping just short of the goal which subsequent exploration has revealed. A great fact stands looming up before his face, but, through the excess of light which he has already taken in, he is blind to its presence. The intellectual effort already put forth has left no surplus for a more extensive sweep of comprehension, and further progress requires a new start and forces generated from a fresher mind."* With faculties unjaded and unwarped, Lister appeared upon the scene. The long lines of thought devoted to studies of the growth and life-history of microscopically minute vegetable organisms led up logically to the inception of his task and its final consummation.

As a further stage of the evolution of moral forces based upon the element of safety, came an inquiry as to the effects of the antiseptic agents themselves upon the individual, and the behavior of the tissues, when contact with possible sources of infection was eliminated. Two facts were thus developed: (1) It was ascertained that the use of germicidal agents was a not unmixed good; (2) that the prevalence of pathogenic bacteria was not nearly as great as had been formerly supposed; and (3) that the tissues themselves, when uninjured, possessed a certain

* Professor Fisk, "A Century's Progress in Science," *The Atlantic Monthly*, July, 1896.

amount of resistance to the invasion and effects of these latter, the lessening of this resistance being in direct proportion to the extent of the injury inflicted upon the parts by the operation itself, or by whatever was brought into contact with them. With the study of the natural processes of repair, of tissue-resistance, and evolvement of the *locus minoris resistentiæ*, came the demand for the protection of living cells, and the evolution of asepsis. Slowly, but surely, this portion of the chain was forged and fashioned, until it stands as the connecting-link between the pound of cure of the past and the ounce of prevention of the future.

The last link of this chain to be worked out was the evolution of the aseptic conscience. The entire circle of protection thrown about the operating-field could be broken and every precaution set at naught by a lapse of watchfulness, or want of care on the part of any one of the participants in the operation. It was early recognized that constant vigilance was the price of safety, and hence arose the necessity of inculcation in the assistants by the operating surgeon of precept upon precept and line upon line. The knowledge derived from Cheyne's labors, that even the air of hospital wards was comparatively free from noxious germ-life, led to the inquiry as to the sources of the infecting agents; and when it was realized that these were to be found in the skin of the patient, his clothing and hair, the hands, and particularly the finger-nails of the operator, the persons of nurses, and, in fact, everything with which the patient might come in contact, which had not been previously disinfected, the necessity for the most rigorously protective environment was declared and emphasized, and the responsibility of the operator increased. This extreme degree of surveillance was soon followed by a highly developed mental sensitiveness in those engaged in the work, which rendered them suscepti-

ble to and conscious of the slightest act calculated to impair the purity of the aseptic technic, either on their own part or that of others.

THE RÖNTGEN RAYS IN SURGERY.

Sound knowledge of pathology and correct diagnosis must always remain the groundwork for successful treatment, and no surgeon, however skilful as an operator, can hope to attain the acme of usefulness in his work without these. The substitution of accuracy for guesswork, of certainty for uncertainty, of positive knowledge for abstract theorizing, must ever be attractive to the scientific mind. The discovery of Professor Röntgen, of Würzburg, within the past year, of the peculiar power of certain rays to pass through substances that are opaque to what we know as light, bids fair to be to surgical diagnosis what animal experimentation, anæsthesia, and asepsis are to operative surgery.

The story of the discovery of the Röntgen rays reads almost like a chapter from one of Bulwer's tales. One night, while working in his laboratory with a Crookes's tube trying to fathom the mystery of the cathode rays, his attention was attracted by a piece of paper lying upon the work-table, upon which appeared a luminous, sparkling spot, as if a single ray of bright sunshine, coming through an opening in a dark shutter, had fallen upon it. This explanation of the phenomenon was manifestly impossible, since it was night. The reflection was too bright to proceed from his induction machine. Upon examining the piece of paper closely, he found that the reflected light had been given off from a portion of the sheet where some idle student in the laboratory had carelessly traced the letter "A" with a platinum-cyanid solution. He at once came to the conclusion that the illumination of the

paper must have been caused by the rays from the cathode of the Crookes's tube, although these were invisible to the eye. The mind of the practical surgeon grasps at once the possibilities of not only detecting the presence of foreign bodies, but the relative positions of the fragments in fractures, and of articular surfaces in dislocations. Both the methods of immediate inspection by means of the fluoroscopic tube and screen, as well as permanent record through the medium of the skiagraphic plate, are already in use, and yet not a twelvemonth has elapsed since Professor Röntgen announced his discovery. One year ago to-night the possibilities of the application of this one of the results that have been evolved from the labors of Faraday, Maxwell, Hertz, Lenard, and Röntgen were scarcely dreamed of; and yet such has been the contention for the privileges of priority that practical methods have been rapidly brought forward, through the labors of Edison, Pupin, and others, for the utilization of this vast work for the purposes of practical surgery.

When we pause and gaze upon the magnificent structure that has risen during the present century, every stone of which represents the strength of a patient, earnest, and conscientious worker, cemented together only too often by the life-blood of the martyr, it is scarcely possible for the human mind to realize that so much could be accomplished in so short a time, much less grasp the possibilities of the future.

The lessons of the past gather about us like the falling leaves of a summer's departing glory, but they are not lost nor wasted. Properly interpreted, they serve to emphasize man's opportunity in the present and his hope for the future. Not the least among these lessons is that which teaches us that the unfolding of nature's secrets is but a part of the plan of the creation; that irresistible forces are at work evolving truth and casting aside error;

and, finally, the man's present position in this great work removes him from the place of a creation of the hour, and stamps him as the product of all time and the heir of all eternity.

The century upon the threshold of which we stand is lighted with jewels of hope in golden settings, and its atmosphere is filled with the sweet music of promise. The brightness of the one and the melody of the other is enhanced by the thought that no Macaulay-like prophet has conjured up the vision of a horde of wolf-like charlatans running riot among the fallen columns and dismantled arches of the Temple of Science, that mighty citadel so graphically described by our own Holmes as

> The towering pride of twice a thousand years.

VALEDICTORY ADDRESS.

BY JOSEPH D. BRYANT, M.D.,

THE RETIRING PRESIDENT.

Two years ago it was my great honor to address you as President-elect, and in doing so to pledge my earnest thought and conscientious labor to the support of the best interests of the organization. Surely, the responsibility attending a pledge like this could not be estimated lightly, as the results would be compared only with those of brilliant outcome, secured through the tireless patriotic endeavor of wise predecessors.

Whatever may have been the commendable product of the last two years of effort, can be decided only by the Fellows themselves and the logic of coming time. Of this, however, you may be certain, that which was done or left undone, whether wisely or not, was regarded as for the best interests of the organization. The feature of the Academy that gives to it the prosperity and importance it now possesses, is its excellent public library.

Earnest and public-spirited citizens of all classes view and support alike the manifestations of intelligence and public pride, that contemplates the elevation of professional standard or the exaltation of public station, to the highest possible plane. No better evidences of these facts are needed than that which is a part of the history of the successful advance of the Academy during the last few years. Munificent sums of money and substantial moral support have been bestowed in its aid by those who regard the advancement of professional and public service as the natural outcome of praiseworthy endeavor on the part of all concerned in the professional and public good.

No monument yet dedicated to commendable virtues can appeal to the observers of past or present effort with a more pronounced and suggestive emphasis than does the magnificent home which we call our own, with a sense of pride justified by example in structure and loyal effort. Those who conceived and consummated this result, builded not alone for this day and place, but for time to come, and in every station where example and precept can wield an influence.

It is not my intention to indulge in figurative speech tonight, but instead to construct my brief remarks along the line of practical utility. The condition of the funds of a healthy organization is the stimulus of its prosperity. And when for any reason their value or character become impaired, the vitality of the organization is lessened, the same as is the human organization by the presence in its vessels of unwholesome and vitiated fluids.

A wise administration of the funds should be exacted by those who contribute to them; an administration which contemplates the largest returns consistent with the integrity and usefulness of the entire outlay. At the risk of trespassing on your patience I will call your attention to several of the important factors of common interest in the conduct of the business of the Academy, not the least of which are the

Printing and Stationery. The council is now assured, after careful examination of the methods of outlay in this respect previously practised, that the expense can be considerably reduced by a careful classification of the matter, with open bidding by reputable parties, followed by wise distribution on requisition made by those officially entitled to the use.

The products of the labor of organized effort cannot be known, nor their usefulness properly estimated, unless well-defined measures be taken to acquaint the outside world of their presence and value. With these objects in view, a thousand volumes of the transactions of the Academy have

been printed from time to time, many of which yet remain in the upper rooms of the building, each volume awaiting in vain a reclamation by the respective member of the organization to which it belongs. In order to obviate a repetition of this kind, the council has determined to make the delivery of the forthcoming volume a part of the estimate of the current expenditures of the Academy. It may not be uninteresting for the Fellows to know that the present annual estimate for printing and *delivery* of the transactions will fall below the previous outlay for printing only. Although the saving is a small one, still it, with the delivery of the books, can be regarded as an earnest of a determined effort on the part of the management to labor in the best interests of their constituency. The members of the council are now disposed, I think, to regard as a wise measure the allotment in December of each year of a certain sum of money for the annual requirements of each phase of the management of the affairs of the Academy. And after closure of the annual budget that no further increase in the total expenditure should be recommended for the year, except for urgent purposes and with the unanimous approval of the council. I am certain that a well-considered course of this kind will lead to a further reduction of the expenses of the management of the Academy. In any event, a method like this begets care and discretion in monetary use, and fosters prudence and thoughtfulness in the employment of its products, both of which lead to a prompt and healthy appreciation of good business principles.

The trustees are disposed to regard it as wise that prompt provision be made to pay off the remaining indebtedness of the Academy. Inasmuch as the sum is not a large one ($10,000), it seems that special allotment of funds should be made at once for the purpose. When it is noted that the increase in the library fund will provide in part for other means heretofore appropriated to that need, it will be seen

that the indebtedness can be quite promptly met by a special yearly allowance set aside with this intention.

The Heating and Ventilation.—It needs no mention at this time to remind one of the fact that both of these essentials of good health and personal comfort are strikingly defective in this building. The results of the destructive influences of time and use on the conservative outlay made at the beginning, reminds those who are occasional attendants of the regular meetings only that the time is not far distant when radical measures must be adopted to remedy these defects. Certainly, it is hardly consistent in us to expose our friends or ourselves to contingencies of this nature while uttering learned disapprovals of their presence in other places.

The By-Laws.—A revised edition of the by-laws should be published as soon as the new and amended additions of the old, which are scattered through the minutes of the Academy, can be brought to light and introduced into their proper places. At the present time it is often quite difficult to be well informed of the presence of a special by-law of modern birth, in the absence of the responsible agent of its creation. The proper codification and printing of the rules relating to the control of the Academy, would enable those interested in its government to act with becoming knowledge of its requirements. The present rules have thus far served their purposes wisely and well. The conservative and discreet construction of the tenets which have led to eminent success, is a wiser guide during transition periods, at least, than are the untried and often ill-considered measures of the enthusiastic and devoted contention that often attends established achievement.

The Library.—The library is the vital organ of the Academy, and on its standard and use depends the status of the organization and the *esprit de corps* of the membership. It is, indeed, gratifying to note not only the present numerical

standard of the library, but also the rapid increase in this respect. The library contains now substantially 46,000 volumes, 10,000 of which are duplicates, leaving 35,640 volumes as the proper working strength of the collection. The numerical standard is stated thus carefully at this time in order to correct the wrong impression already given by the President regarding this matter, based, as he believed, on a prudent representation by competent authority. The annual increase is from 2,500 to 3,000 volumes. The journal room of the Academy is the silent though eloquent recording place of the passing medical events of the time. And, when it is considered that no less than 680 medical journals, representing the medical achievement and thought of twelve different nations, are open to easy conference there, then, indeed, can one say of journals that which Bulwer-Lytton said of books:

> "Hark! The world so loud,
> And they, the movers of the world, so still!"

The sustaining funds of the library are the special and general funds. The former fund is established for that purpose alone—the latter comes from the Academy funds, and, therefore, the size of the total amount is controlled by the degree of prosperity of the organization and the wisdom of the conduct of its affairs. The Academy library has had for some time the stimulus of the income from $21,700 bestowed by generous friends for that purpose. The council of the Academy, with the approval of the Fellows, conceived a few months ago the idea of increasing the amount to $100,000, the income of which should be used only for the purchase of books. The fact of the appointment by the President of a committee to secure the additional $79,000 is already a matter of more than local history. And while scarcely greater time than a year has elapsed since the effort was begun, quite $30,000 of the $79,000 are already subscribed, but not yet available for the purpose in question,

as $50,000 must be subscribed before the contributions need be forthcoming. And when it is noted that scarcely more than one-half of the members of the committee have yet reported subscriptions, the final outcome can be easily told when a unanimous and vigorous effort shall characterize the action of the entire committee. It occurs to me to say at this time that the income of $50,000 for the purpose of library endowment should be a strong incentive to those who are interested in the success of the Academy and the advance in medical knowledge, to secure promptly the additional $20,000 essential to the availment for this purpose of the proceeds of the larger sum. More than $4,000 per year are now allotted to library needs from the funds of the Academy, which, together with the income from the $21,700 already in use, provides not less than $4,500 per annum for the purchase and preparation of the books and journals of the institution. If to the $4,000 allotted from the general funds be added the income of the $100,000 we are soon sure to get, then, indeed, a yearly purchase of books can be made which will comport with the demands of the profession and the dignity of the metropolitan city of the continent.

The Membership of the Academy.—The roll of membership of the Academy exhibits a continuous and healthy increase from year to year. There are now 807 resident members, and 70 non-resident on the record. We are of the opinion that a slow, steady, and spontaneous increase in membership forms a much more substantial and useful constituency than when founded on the urgent solicitation of personal effort. The appreciation of the advantages extended, prompts the membership of the former; while friendly complaisance only may determine that of the latter. However this may be, the Fellows should be ever ready and earnest in pointing out with proper emphasis to all worthy members of the profession the advantages and credit of belonging to a medical organization which commands so much

of the respect and confidence of the public, and extends to all such wholesome opportunities, as does the New York Academy of Medicine.

The present idea of the social management of the Academy is a liberal one, intended to encourage the assembly within its walls of all reputable bodies that have in view wise and approved notions of the achievement of the objects of our own existence—the prevention and relief of human suffering, and the extension of human comfort and usefulness. The natural results of this fraternal policy will strengthen the organization in every channel of public thought and enterprise, and not infrequently add to the manly assets of the Fellows the chastening influences of self-abnegation.

The Bureau of Nurses.—The wisdom of the founding of this department of medical service in the Academy cannot now be reasonably questioned. The financial obligations which it incurs are much more than met by the similar returns standing to its credit. The standard of competency exacted for registration of nurses was wisely conceived, and if adhered to by those requiring their services, will continue to provide proper aid of its kind in each of the classes of medical requirement. The liberal registration fee, the facility of communication with the bureau, and the promptness of response, as measured by the rarity of complaint, bespeak the support of all who are in need of the fostering care of its purpose.

The Sections of the Academy.—The sections of the Academy are the work-shops of the organization, and the pages of the medical journals of the country are enriched by the results of their monthly labor. Once each year, each section contributes to the professional treasury of the Academy, at a regular meeting, the significant products of its deliberations. Thus it is seen that the scientific enterprise of the members of the respective sections covers not only the

entire field of practical medicine, but renders to the parent organization the best of its yearly attainment. It was once predicted by those who doubted the wisdom of this plan of labor that these sectional appendages would finally wag the source of their creation. However, such has not been the case, but instead the sections vie with each other, in a healthy and loyal way, to make the regular meetings of the Academy an eminent success. I am disposed to regard it as wise that the roll of membership of each of the sections be submitted to a yearly review, so that both the secretary of the Academy and the section will be possessed of an accredited list of the members. A precaution of this nature will prevent any misunderstanding that might arise as to the individual rights of members of the section in matters relating to their own government.

Everyone in attendance at the regular meetings of the Academy is now reminded of the forethought and wisdom of the late president of the Academy, Alfred Lee Loomis, M.D., LL.D., whose gracious bequest contributes so largely to the personal comfort and increasing good-fellowship of the members of the organization. Surely, the beneficent influences of this mindful bequest are akin in their effects on the human perceptions for good, to those manifestations of a higher care addressed to all living beings.

I have entered thus somewhat into detail, in order to remind the Fellows that there is much more to the organization than meets the eye. It occurred to me that an acquaintance on your part with the detail of important matters would enable you to approve of the general outcome with intelligent appreciation, rather than with a sightless confidence in the administration of your affairs.

The irrevocable edict of time now marks the termination of this period of my services in your concerns, and in relinquishing the official trust which you have reposed in me, I venture to express the hope that you will regard me as hav-

ing been earnest and faithful in my efforts, irrespective of the outcome. The generous support, and the exhibition of confidence that have been accorded me by the officers and Fellows of the Academy, together with the tender solicitation for further honor at your hands, reminds me more forcibly than does any other experience of mine, that I have not lived in vain.

Perversely unappreciative and blindly ungrateful, indeed, must one be, who fails to recognize the magnitude of the honor conferred and the degree of the confidence expressed in his selection to preside at your deliberations, and act as the sentinel of your financial and professional rank. Actions, not words, signify the better one's appreciation of the weight of an obligation. Therefore, while thanking you sincerely for the bestowment of the honor, permit me to pledge anew in support of the Academy the loyalty of purpose of one who has received your highest consideration.

INAUGURAL ADDRESS BY THE PRESIDENT-ELECT, EDWARD G. JANEWAY, M.D.

Fellows of the Academy:

Allow me to express to you my deep sense of appreciation of the honor conferred by the unanimity of action on your part in selecting me to preside over your deliberations for the ensuing two years. When certain members came desiring to propose my name as that of their candidate for the office, my first intention was to decline, not because of any lack of interest, nor on account of any failure to recognize the importance of the position, but owing solely to the belief that there were those who, by virtue of more work done for the institution, or by virtue of their accomplishments for scientific or practical medicine, had, to say the least, an equal, and some by seniority a greater claim for your favor. When, however, it seemed probable that there

would be no opposition, and when I had been assured that my predecessor would not accept a renomination, then I acceded to the wish of my friends, in the hope that this would prove a serviceable matter for the Academy itself, and consented to be a candidate. That the result has been as anticipated cannot prove other than a stimulus to the incumbent to accomplish the most possible within the legitimate sphere of his activity, and to act with impartiality in such matters of dispute as may arise, feeling that the surrender of claims by others, as fitted for the position at least, was intended to indicate a desire on their part and on yours to avoid struggles in order to build up our association freed from internal sources of annoyance and discontent. Such at least is the interpretation which has forced itself upon me, and if you regard the matter in the same light, the outcome is that we are all, you and I, under moral obligations to work as intently as possible in order to enlarge the influence of the Academy, to maintain and increase the interest in our meetings and deliberations, to preserve I was about to say, to augment I should say, the good work already accomplished on behalf of medical education, of the improvement of the public health, and of a higher moral tone in the medical profession; to labor also with good will for the completion of the partially achieved library endowment undertaken by my predecessor, and, I trust, to be continued by him until the sum proposed is raised; and it may be to look forward at the proper time to a new field of effort in the endeavor to have a laboratory, as well as a library, not alone a place of reference, but also a workshop for the members.

There exists a strong wish and hope that no difference of opinion on any important matter may arise between the President and any considerable number of the Fellows, but if there should, and this hope prove fallacious, then let us each mutually concede to the other without grudging the right of independent judgment, and hold to the idea that

notwithstanding a contention as to the best method, each may be actuated by right motives. Under such circumstances it does not seem possible that diverging views can do other than become blended by the lens of our mutual esteem. Such, at least, is my trust and belief. We should, in any such juncture, remember that Rome was not reached by one road only, but rather that all roads in her vicinity led thitherward.

My predecessor has informed you very fully on our present condition, and the perusal of the forthcoming history by one of the founders will supply any hiatus which may exist. Moreover, the speeches at the late celebration have contained so much about past affairs, that in this inaugural my attention must be largely given to certain matters which will, no doubt, serve to accomplish some good if carried out according to the desire of the speaker.

A consideration which should inspire us to achieve the best possible for this institution is offered in the era in which it is our lot to be placed. This Academy has just completed her fiftieth birthday celebration, and the noise of the rejoicing over the event has scarcely died out; in fact, for some it may obscure the call for duty as we begin the further climb toward the century mark. The ensuing three years will be the last of the nineteenth century unless perchance the claim be true, which I am told some have urged, that the calendar is so far wrong that we are already out of its bondage. However that may be, we will still write ourselves for the time mentioned as belonging to the century which gave us birth and has witnessed our growth.

Then let us be fired to make the close of this era one which shall be memorable in the archives of this society. As we wander back in memory over what has been achieved during this epoch in all branches of medicine and of the sciences connected with it, our minds must be stimulated to make the work done at the close a fitting cap for the climax. The

speaker has so recently related before this audience many of the notable events in the progress of medicine, as distinguished from surgery, in the last quarter of a century, that he cannot to-night touch upon the subject without repetition. There were, however, two matters of progress not so intimately connected with medicine or coming before the time mentioned which were omitted, that he is desirous at this time of a short recital concerning these.

Last year witnessed the semi-centennial celebration of the utilization of anæsthesia for the performance of painless surgery. America, in the person of Morton, brought to light this benefieent measure, and though Boston was the place of the first celebration and also of the anniversary proceeding, yet we of New York, as well as the world at large, have reaped the benefits. It does seem as if Morton, in his lifetime, had not received sufficient reward of public appreciation. We are willing to do honor also to Wells for his efforts with nitrous oxide in the same direction, and even to believe that it formed the germinal thought for Morton; and also that Jackson may have some claims to consideration; and that Simpson is worthy of honorable mention for introducing chloroform. Be these as they may, Morton deserves on this occasion a just recognition of the service which he rendered humanity when he first publicly demonstrated that it was possible to do the work of the surgeon without infliction of pain. We of America still adhere to ether, as in the majority of instances the safest and hence the best of anæsthetics. Others have come in addition to chloroform, which abroad is more used than ether, but practically sulphuric ether and chloroform, the first introduced, still stand as the rival claimants for use. I cannot but think that, as has been the case with the binaural stethoscope, the birthplace has blinded the mind to the true recognition of the advantages of these American developments. However that may be, no question exists in my

mind that anæsthesia has been one of the greatest boons of this nineteenth century, without which the developments of modern surgery would have been impossible, and while some may say that the idea and its fulfilment would soon have occurred, yet at the end of fifty years of its use, there is no more appropriate place than this, the central medical institution of the largest city in America, where exist the most hospitals, where daily painless operations of great severity are performed, and where the absolute immobility necessary to the conduct of the delicate dissections essential to relieve suffering humanity of diseased tissues and morbid growths are daily witnessed, to again laud the man who first demonstrated after a preliminary experimentation upon himself the practicability, the safety, and the humanity of using sulphuric ether during surgical operations. We place with willing hands this laurel wreath of gratitude, acting for thousands of those ignorant of their benefactor, upon the memory of Morton.

I desire at this time also to give expression to the thought of many in doing honor to the achievement of our fellow-associate for his contribution to the relief of those struggling, strangling, and suffering with laryngeal obstruction. Intubation has been of great service, and its modest discoverer and introducer should at this time receive an appropriate meed of honor. He has quietly, willingly, and without compensation given this production of his thought, labor, and experience for the benefit of anyone in need by whoever was capable of its use. How different this method appears when contrasted with the action of those who first employed forceps for artificial extraction, when natural forces were unable to labor effectively longer; and how different from the action of those who discovered an improvement in any of the other branches of human activity. Patent rights secure a fortune either for the inventor, or more often for the man who buys at small price of this one in need, that which

makes him rich. Then let us to-night do honor to our associate, Dr. O'Dwyer.

In answer to the question, what work can the Academy do during the next two years which shall tend to improve its influence, and also to exert a favorable impression upon the public mind? we would say that among those topics about which a decided expression by the Academy would be of great value, there stands prominently the subject of expert medical testimony. Can a person who is retained by one party to a legal contest give unbiased testimony, or will he not inevitably, no matter how honest his intentions, be unconsciously drawn to give the preference to the side which he represents? Especially will this not be true when, besides giving his testimony on the stand, he has previously and subsequently coached the lawyer of the side which employs him as to the best method to win the suit and entrap the medical witness of the opposite side into some erroneous, equivocal, or unguarded statement by which the jury may be influenced rather than by considerations of truth and honesty. Is it not regarded rather in the light of a contest, not for the triumph of the truth, but for personal emolument and honor of a dubious kind! The question to be solved is by what method other than the present can the legal rights of contestants be preserved, and yet medical men be freed from the reproach which the public so frequently heaps upon them for their participation in these controversies. On two occasions of recent date lawyers eminent in their profession stated that they paid no special attention to medical witnesses, as it was generally recognized that what opinion was desired could be procured. I objected to this statement as not a fair presentment of the facts so far as honorable medical men were concerned; but it will serve to show to what a state the action and evidence of some so-called experts has brought the fair name of the medical profession. It seems to me that it would be a wise measure at the appropriate time

to appoint a committee to study this question in a careful and judicial manner, and after having given it sufficient consideration to bring their conclusions in a paper before the Academy in order that after a thorough discussion we might be able to show a legal course by means of which our profession could be freed of the odium now attaching to it in this regard.

As this Academy is made up largely of hospital graduates, and as all members have been medical students, and as we number in our list of members the representative teachers of the medical colleges in this city, here may not be an inappropriate place to introduce two subjects of sufficient importance to warrant my bringing them before you. It has often been said that reform should begin at home, and it is not so uncommon for shoemakers' children to be shoeless. I do not know whether any of you have ever inquired as to the care exercised by the authorities of our colleges and hospitals over the health of those under their control. I must myself plead in a mitigated way to guilty in this regard. But when I consider some of the facts within my knowledge, there arises a tinge of sarcasm when I read of the necessity of having medical men on the boards of direction of schools, etc., in order that proper regard shall be had for the preservation of the health of the scholars. In all our literary colleges there can be no doubt that sufficient effort is made at the present time to have the sound body as the case for the sound mind. But what are the facts as regards our medical colleges? Can the student attend closely to the curriculum marked out for him and have sufficient time for enough out-door exercise and recreation to maintain reasonable health? It would not be an error to say that not one in five of the attending physicians of hospitals is acquainted with the mode of life enforced on the subordinate medical men by the work of the institution. Because a system has gradually materialized this must be adhered to. The

atmosphere of hospitals in particular, after a time, exerts a depressing influence on those living within it, and the older the institution the more of hospitalism there is. Could you have heard, as I did not long since, the statement of a father whose son, a bright young physician, full of promise, had from overwork in a city hospital, fallen a victim to a fatal malady, you would know why I make this plea.

At the present time, with the large number of young medical graduates earnestly desiring to obtain an opportunity to serve in the hospitals, it does seem as if some plan could be devised to gratify the wish, and at the same time to attend a little more generously to the health of the young medical men. I am sure that if the section on public health, which includes medical education, would appoint a committee to study the matter, both as regards hospitals and medical colleges, and that if this committee went earnestly to work, that results of much good would be the outcome. I should be willing to have the committee composed entirely of college and hospital men, only they should closely scan the existing state of affairs with minds desirous of bringing about such change as a careful scrutiny should suggest as practicable. With the four years curriculum it seems that much improvement in college life might be made. In a late examination at a hospital with which I am connected there were fully twelve times as many applicants as there were places to be filled. Many of those who failed were but little inferior on the lines of the examination as held in contrast with those who succeeded; and possibly had the examination been altered somewhat, they might have, in some instances, been as much superior. For in not a few hospital examinations men who have proved inferior in college life have procured places over those who outranked them in all-round work. This feature is inevitable, but it does seem that New York could, with all its hospitals, do much more with this large number of young physicians, eager and anxious to do

the work in order to gain the experience. I speak as much on their behalf as I do on account of those who have obtained service, but are often overworked because of all required under the existing state of things. It is my belief that in no way could medical education receive a greater impetus than by the successful application of some plan for the employment of a number of graduates, or even advanced students, in certain phases of hospital work. As regards the hospitals, they would receive a corresponding advantage. Everyone connected with hospitals knows the difficulty in securing adequate histories and in carrying out the history so obtained to completion. Many points of examination could be made more frequently which are now occasionally done in consequence of the work already crowding the internes. I, for one, do not believe in getting all the work of which young men are capable all the time, without regard to the effect upon their present and future health.

Before passing from the subject of hospitals, mention should be made of an example of munificent generosity in the right direction in the gift of $1,000,000 by one of our benefactors, not in order to develop a new institution, but to enable one already in existence to continue and enlarge its sphere of usefulness. This hospital is one devoted not alone to charity, but also to medical education. The multiplication of new institutions is to be deplored; the upbuilding of the old, as in this instance, is to be praised. For the Academy I can thank the donor for his gift.

The presentation this evening of the portrait of Dr. Alfred L. Loomis, former President, whose wise counsel and helpful assistance added greatly to the accomplishment of the procuring of this site and building, of which it will be the pleasing duty of Dr. Polk to speak, and so bring back to your minds those qualities which made him what he was, suggests certain additions to our possessions. Why should this Academy not have a fuller gallery of portraits of the

distinguished members of the profession after their decease? Many visit us who would like to scan the appearance of the man of whom they have heard, or whose book they have read, or whose discussion in this Academy of a prior date they have perused. Reserve, if you please, this hall, with a few exceptions, for the officers of the society. On looking over the portraits and other representations of prominent medical men I miss more especially that of the late Dr. Austin Flint, and find only a crayon likeness of Dr. Alonzo Clark in the library, no doubt a congenial place for him. It would be a graceful act for the friends and students of these two distinguished teachers to combine and present the Academy with fitting portraits. Dr. Alonzo Clark was for so long a time the principal consulting physician of New York, a man of broad views, of affable bearing, confidence inspiring, of simple tastes, punctual to a fault, though he walked or used the public conveyances, a remarkably clear lecturer, knowing well how to drop the unessential in order to store the mind of the student with the necessary, that it excites no surprise that he took an active part in the discussions here, and was honored in this Academy, as well as by the many who sought his advice and counsel.

So also in the case of the late Dr. Austin Flint, who was at one time the President of this Academy. He was a man of noble instincts, earnest, always a student, retaining his enthusiasm to the last, devoted to the higher paths of our profession, with whom long association deepened respect; there exists in this Academy no representation of this formerly popular teacher, honored consultant, and noble physician. In these two instances there can be no reasonable doubt that if this matter were properly presented to their former friends and students, fitting portraits would be obtained, and these gaps which exist be filled. Noble men are scarce, and whatever difference of opinion may have existed in one instance, that surely now sleeps in the grave, while memory brings

back all those traits which make us say that these two were of nature's noblemen. A third former teacher still lives, an honorary Fellow of this Academy, and of him I find only a small photograph in the album. I may not say of Dr. John T. Metcalf what I would because he still lives, but I may say that his portrait should be with these others; they belong together. This Academy, the central medical institution, should have these joined to those already here, and to that of Dr. A. L. Loomis, to be presented later, another of the departed great teachers of medicine. Of two of the deceased Presidents of the Academy, Dr. Thomas Cock and Dr. Alfred Post, likewise no portraits adorn our walls.

Before passing to the final part of my address, I should say that a consideration of a subject so fruitful of thought at the present moment as the control of tuberculosis would enter into this paper, were it not that I had already discussed the matter after very careful study, and those of you who desire can read the paper in Vol. IX. of the second series of the publications of the Academy.

My predecessor has, in his address, advised that preparation be made to cancel the remaining debt of $10,000 upon the Academy. This can, it appears to me, be accomplished within the next three years. Should the ordinary income not prove sufficient for this purpose, some plan could be devised by means of which the sum necessary could be obtained. Debt may not perhaps be as much of an incubus to you, but I must confess to an absolute aversion to be in debt, if possible to avoid it, whether for myself or for institutions with which I am connected. Debt is a paralyzer of effort when striving after some new object of desire. So that while there looms up in my mind the picture of the Academy possessed of a laboratory or possibly laboratories for thorough study by the Fellows so desiring, I would not feel justified in urging any action on such project so long as any debt remained on this building. When this has been

removed, then will be the proper time to pass from the day-dream stage toward the active construction efforts to bring the dream to a realization. The condition of the heating and ventilation of this building will, as your late President has told you, need attention. He has given you the reasons for this state of affairs. The repairs and alterations will undoubtedly prove an item of some magnitude, but when completed the Fellows will be able to have the temperature of one room made suitable without, as at present, inflicting discomfort through foul air or excessive heat in other parts of the building.

Allow me once more to thank you for the honor which you have bestowed and to pledge to you that in desire it shall be my aim to have the interests of the Academy first in my thoughts. Moreover, there exist for me no associations which will serve to divide my affection, or withdraw me from effort in your behalf. I look with regret at the number of societies to which many of our Fellows belong, and to which they give an allegiance and support in some instances greater than goes to the Academy. It would not be desirable that they should give up these, which are, in many instances, the grouping of congenial persons with a common aim, but I will ask not that they love these less, but the Academy more. Let us then work together with willing brains for right growth, increase of power, freedom from debt, a library endowment, and a laboratory.

CONTRIBUTIONS OF BACTERIOLOGY TO THERAPEUTICS.

THE WESLEY M. CARPENTER LECTURE FOR 1897.

BY WM. H. PARK, M.D.

The subject of the essay this evening will be considered to be broad enough to cover not only the contributions of bacteriology to therapeutics in diseases where the specific micro-organisms are known, but also in those in which, though as yet undiscovered, we believe them certainly to exist.

That we may be able to estimate correctly the results obtained in the treatment of individual diseases, let us review briefly the facts already established, and some of the theories advanced to explain the means through which bacteria as a class produce disease, and the living body strives to protect itself.

Bacteria may be considered to cause disease either by their mechanical presence in the tissues, by the poisons produced by their growth, by the withdrawal from the body of necessary food substances, or by other ways as yet unknown.

Although micro-organisms probably cause injury in all of these different ways, still they are now believed to cause it chiefly by the reaction upon the body cells of the poisons they elaborate from the tissues in their growth.

Each variety of bacteria probably produces one or more specific as well as general poisons. These in some instances have been partially isolated and studied, as in tetanus and diphtheria.

Bacteria, neither in the living body nor outside of it, can develop and increase in numbers without changing the substances upon which they grow. Outside of the body this activity results in fermentation, putrefaction, etc., inside the body in disease.

Although, as we shall see, many complex factors influence the degree of the susceptibility of the body to infection from any germ, nevertheless the most important, and perhaps all-embracing, one is whether or not the body at the time and place of infection is in the proper conditions for the growth and activity of the organism, for without the existence of one of these conditions no micro-organism can produce disease. The living body is certainly not a good soil for most bacteria to grow in, even after they have penetrated the outer protecting shell of skin and mucous membrane. The reasons for this are, however, only partly discovered.

While it is true that the body temperature and the concentration of food stuffs in the blood and tissues render them unfavorable for the growth of many forms of saprophytic bacteria, nevertheless these conditions are not unfavorable for the growth of most pathogenic varieties, and can hardly be thought to explain the great variation in virulence between different varieties of the same species. Thus if one single streptococcus of a very virulent culture is deposited in a rabbit's tissues, it reproduces itself a million fold in a few hours, and kills by septicæmia in twenty-four hours, while a million streptococci from another culture, injected all at once, will die instead of developing. Both these cultures will grow, however, equally well in the serum after its removal from the body. We must therefore add to the other factors influencing growth qualities possessed by the tissues which belong to them only while they remain alive.

Protection against infection exists in different degrees in the same individual toward different bacteria and among different individuals toward the same bacteria. It may be either natural or acquired.

Long before bacteria had been detected it had been noticed that different races of men, and even individuals among the same race, varied in being more or less susceptible or refractory to different diseases. It was also noticed that persons were not apt to contract certain diseases twice, at least not within a short period of time.

The causes of this immunity, natural or acquired, are still only partially understood. If we inject a few virulent anthrax bacilli into a susceptible animal, we find that very soon the bacilli begin to increase, cause a local swelling, then fever, severe illness, and death. If we infect an animal of the same species which has been previously immunized, the bacilli not only do not increase, but soon die, and so no disease develops.

In seeking for the reasons for the different action of the bacilli, it was found that in the non-immunized animals the bacteria after their injection developed unhindered by any action of the cells or fluid substances, while in the immunized animals certain cells were attracted to them, and that these cells later absorbed and destroyed them. A recent piece of work by Mennes upon pneumococcus infections would seem to show that this attraction of the leucocytes for the bacteria was not wholly due to any inherent properties of the leucocytes, but rather to the effect of substances in the serum on the leucocytes, for he found that when pneumococci were added to non-immunized serum to which leucocytes from immunized blood had been added, no phagocytic action took place, but that when leucocytes from either immunized or non-immunized blood were added to immunized serum, they at-

tacked the bacteria. Besides this action of the cells the blood probably contains substances directly bactericidal. In addition to the substances, we know that antitoxic substances are developed in the blood. As to the nature of the action of the toxin and antitoxin upon each other, there has been much curious speculation. As a working hypothesis the following is given; it is a slight modification of that given by Knorr:

We may consider that a toxin is a substance which is directly poisonous according to the intensity of its affinity for the cell substance of any living body.

Thus the cell substances of a chicken, which can withstand enough tetanus toxin to kill thirty horses without effect, but which can still be affected by larger doses, may be considered to have ten thousand times less attraction for the toxin than that of the horse.

If we consider further that the toxin has even a stronger affinity for the antitoxin than for the cell substance, we can explain how its affinity becoming satisfied it no longer injures the cell. Its poisonous power is thus neutralized.

An antitoxin can, in my opinion, be best conceived as a toxin which has been changed by its contact with the living cell substance, either within the cell or outside of it. The antitoxin may have been changed by uniting with a portion of the cell substances or may have been simply acted upon by it.

Others consider that the antitoxin is secreted by the cells, the toxin simply acting as an irritant, and that the antitoxin also acts upon the cells, rendering them insusceptible to the poisonous action of the toxin.

It is difficult for me to conceive that cells are so constituted as to have the power to produce in response for each irritant a specific antitoxin. If, however, we consider the antitoxins to be toxins altered by contact or union with the cells, this specific quality is easily explainable.

As neither toxins, antitoxins, nor bacterial poisons have ever been obtained in a chemically pure state and analyzed, and as an antitoxin cannot even be separated from a toxin by chemical means, we will have to remain satisfied to theorize for some time to come.

Antitoxins do not remain permanently in the blood, but are gradually eliminated through the various organs; so that after a few weeks or months they completely disappear.

As we do not know the nature of the micro-organisms which cause small-pox, syphilis, etc., the immunity which follows after their occurrence is naturally as yet not clearly understood. Some days after the infection the blood does contain immunizing substances, but these are very weak, and it seems difficult to attribute to them the long duration of the immunity. However, when we remember the long persistence of the infectious period in syphilis, it is not impossible to imagine that somewhere in the tissues of persons who have recovered from other diseases where protection is most lasting, there remain micro-organisms, encysted, perhaps, which directly or indirectly cause the production of protecting substances.

Bacteria differ greatly as to the portion of the tissues in which they can develop, and, therefore, in the manner they produce infection. Thus a few tetanus bacilli are driven by a splinter into a wound in the foot, they multiply but slightly, but they find the soil suitable for the production of, and absorption of, sufficient toxin to kill within a few days. The same bacillus, swallowed, finds the mucous membranes unsuitable for the development or absorption of its poison, and, although it develops in the intestinal contents, is therefore harmless. The cholera spirillum, on the other hand, swallowed, develops in the intestine and produces disease; carried by the splinter under the skin it is harmless. The bacillus of diphtheria requires still more different conditions. It is practically

harmless in the intestines, under the skin or in the blood, but lodged in the throat mucous membranes it produces diphtheria.

The bacteria differ as markedly in the rapidity in which they produce disease. Thus, the tetanus bacillus kills quickly by its toxin, the tubercle bacillus invades the tissues slowly, and month after month destroys portions of one or more organs before finally causing death or even serious symptoms.

There are certain general factors which temporarily affect the susceptibility or resistance of the living organism. Thus clinically, as well as bacteriologically, we know that lack of food, exposure to heat and cold, overexertion, extreme youth, old age, and other influences, predispose to disease, while the opposite conditions help the body to protect itself.

These conditions affect us in relation to all diseases, and will, therefore, not be spoken of in connection with the specific remedies under each disease.

In the diseases to be considered to-night we have to examine in each whether, by means of the toxins or poisons which the bacteria produce, or by means of the living cultures, or of the ground-up elements, or expressed juices of virulent or non-virulent bacteria, we can obtain in animals immunity, and whether in such animals the blood contains at any time substances which are sufficiently antitoxic or bactericidal to give immunity when transferred into the bodies of others. Further, we have to decide in each individual disease, what length of time can elapse from the date of the infection or the development of the symptoms, in which the serum will still be able to prevent the development or arrest the progress of the disease. Let us now take up in detail a number of infections, considering in each the progress made.

Tetanus.—Since the advent of aseptic and antiseptic surgery, tetanus has become less common after surgical operations, but it is still fairly frequent after lacerated wounds, especially after child-birth. In New York City, according to the vital statistics, there are about six cases per year of idiopathic tetanus, and forty per year of tetanus neonatorum. The actual number of cases has remained stationary, but the number relative to the population diminished. The treatment of tetanus is still, therefore, of practical importance. In the following remarks I have frequently drawn from a recent and excellent article upon the study of tetanus and its treatment, by Dr. Alexander Lambert (*N. Y. Med. Journal*, June 5, 1897).

The tetanus bacillus is now accepted as being the cause of all the various so-called forms of tetanus, such as puerperal tetanus, tetanus neonatorum, idiopathic, rheumatic and traumatic tetanus. To produce the disease there must always be some wound in which the bacillus finds lodgment. Concerning the bacillus itself it is important to remember that in one stage of its development it contains a very resistant spore. Since Nicolaier, in 1884, discovered and identified the tetanus bacillus as the cause of tetanus, the bacilli have been found to be exceedingly common inhabitants of the soil. They have also been found in many different substances and places—in hay-dust, in horse- and cow-manure, in the air, etc. The spores are very resistant to external influences. Henrijean, by means of a splinter of wood, pieces of which had once caused tetanus, was able after eleven years to again cause the disease by inoculating an animal with a piece from the same splinter. The growth of the tetanus bacillus in the animal organism is comparatively scanty, and is usually in association with other germs. The bacilli remain at the seat of infection, increase as a rule but slightly in

numbers, and do not spread through the body. The disease is, therefore, a true toxæmia and not a septicæmia.

The increase in our knowledge concerning the bacteriology of tetanus has contributed greatly to establish proper methods of local treatment.

The infection, as it occurs in practice, can be considered in the majority of cases as an infection with tetanus spores. These spores require favoring circumstances to develop. If we remove these favoring elements, we render the germs harmless. Thus, in regions where tetanus is prevalent, early and thorough cleansing of all wounds, however insignificant, becomes of more than the usual importance. Tetanus may, and often does, arise from wounds so insignificant that they are healed and forgotten before even the first symptoms of tetanus develop.

Disinfection.—Our ordinary disinfectants or antiseptics must here be considered from a different standpoint than is the case in ordinary surgery. Such disinfectants must be used as are not only antiseptic, but also antitoxic; that is, not only destructive to the micro-organisms themselves, but also destructive to their toxic products, for the toxins in the tetanic wound are almost as great a source of danger as the tetanus bacilli themselves. In some cases where the parts are extensively lacerated and difficult to cleanse, amputation should be performed.

Since the first experiments of Kitasato numberless animals have been immunized against tetanus infection by the production in their blood of a powerful antitoxin, but of no bactericidal substances. After repeated injections of tetanus toxin the blood of horses contains such a quantity of antitoxin that such small amounts as one-millionth of a cc. when injected into a guinea-pig will give an immunity against a fatal dose of poison or bacilli. This immunity will last for from two to four weeks, until the antitoxin has become eliminated.

Tetanus antitoxin has been applied practically upon a large scale in immunizing animals against possible infections.

Thus, our Diphtheria and Streptococcus horses, which are receiving frequent hypodermic injections, run a considerable risk of acquiring tetanus. During 1895 we lost several very valuable animals. Since then all our experimental animals are immunized from time to time with 30 cc. of tetanus antitoxin, and we have had no more tetanus. This same expedient is employed by others with equal success.

Many give all horses which are to be operated upon a protecting dose.

Similar injections should be given to men when they receive lacerated wounds or undergo severe operations, in localities where tetanus spores are prevalent and the disease not infrequent. In suspicious wounds a second injection should be given two weeks after the first, to prevent the immunity passing away before all danger is over.

The power of the tetanus antitoxin to neutralize the poison before it has affected the cells is marvellous and certain, but after the cells have been injured it is slight and uncertain. The results of treatment are not so brilliant as in immunization. When the symptoms of tetanus first show themselves, the cells have frequently been too profoundly affected to receive any help from the neutralizing power of the antitoxin.

We find that if we insert a splinter carrrying some tetanus spores, symptoms will develop in from one to five days. Usually, until the symptoms appear, the animal can be saved by an injection of antitoxin, but after the appearance of the first tetanic symptoms the antitoxin is, as a rule, useless. Sometimes, however, it will save when given a few hours after the first symptoms have developed.

In the larger animals I have seen a number of cases

of acute tetanus treated by antitoxin. None of them was saved. In man much the same results are obtained.

Cases which develop symptoms within six to eight days and run an acute course of 48 to 72 hours, usually show no results from antitoxin treatment. Those, however, having a longer incubation period and tending to a more subacute course, are probably greatly benefited by the antitoxin. Dr. Lambert, in the statistics he gathered, found that in thirty-one acute cases developing within eight days of the time of infection, there was a mortality of 61⅓ per cent., while among similar untreated cases the mortality is considered to be as high as 80 per cent. In cases of long incubation and slow onset of symptoms the mortality under antitoxin in forty cases was but 5 per cent., while in similar cases without antitoxin it is considered to be as high as 40 per cent.

Judged by these statistics, made, it is true, from a small number of cases, antitoxin seems to have positive curative effect in the less acute cases of tetanus.

As it is impossible to tell at the outset which cases are capable of benefit, it seems wise, along with the usual treatment, to give antitoxin in doses of twenty to fifty cubic centimetres twice daily in all cases of tetanus, and to begin the treatment at the very earliest possible moment. At the same time, we must remember that many of the acute and in some of the less acute cases, especially where it has not been given early, absolutely no effect will be manifested.

Diphtheria.—Since Behring's first announcement the antitoxic treatment of diphtheria has been so frequently and so fully treated in numberless publications that I will only dwell on a few points which seem to me of special interest.

Diphtheria antitoxin is singled out among antitoxins by its success in the treatment of diphtheria as vaccine is

among viruses in its prevention of small-pox. The blood of animals subjected to injections of diphtheria toxin is antitoxic but not bactericidal.

The great mass of physicians, especially those of the greatest experience, are, at the present time, convinced that diphtheria antitoxin in doses of two hundred to three hundred units will confer immunity against diphtheria for from two to four weeks, and that the period can be lengthened at will by repeated injections. By this means many children's asylums are now kept free from diphtheria. In many thousands of cases no dangerous results have followed its use.

They are further convinced that when cases are seen early, that is, at a period when the disease can be readily diagnosticated, but before general poisoning has set in, antitoxin can be relied upon to arrest, with but very few exceptions, the progress of the disease.

They also believe that, taking cases as they are met with in practice—the disease just started or far advanced, the infection nearly pure or mixed—the clinical course of the disease is lessened in severity and shortened, and that more cases recover now than formerly. This improvement is most conspicuous in the most fatal forms, the operated cases of laryngeal diphtheria.

The conclusions arrived at by Drs. Biggs and Guerard, after a review of all the statistics and opinions published since the beginning of antitoxin treatment, are so important that I insert a portion of them here.

They state that it matters not from what point of view the subject is regarded, if the evidence now at hand is properly weighed, but one conclusion is or can be reached, whether we consider the percentage of mortality from diphtheria and croup in cities as a whole, or in hospitals, or in private practice; or whether we take the absolute

mortality for all the cities of Germany whose population is over 15,000, and all the cities of France whose population is over 20,000; or the absolute mortality for New York City, or for the great hospitals in France, Germany, and Austria; or whether we consider only the most fatal cases of diphtheria, the laryngeal and operative cases; or whether we study the question with relation to the day of the disease on which treatment is commenced, or the age of the patient treated; it matters not how the subject is regarded or how it is turned for the purpose of comparison with previous results, the conclusion reached is always the same—namely, there has been an average reduction of mortality from the use of antitoxin in the treatment of diphtheria of not less than fifty per cent., and under the most favorable conditions a reduction to one-quarter, or even less, of the previous death-rate.

This has occurred not in one city at one particular time, but in many cities, in different countries, at different seasons of the year, and always in conjunction with the introduction of antitoxic serum, and proportionate to the extent of its use.

Why is it, it may be asked, that two substances such as tetanus and diphtheria antitoxin, so nearly identical in their efficacy as agents for immunization, differ so greatly in their curative value?

The whole secret is in the manner the two infections begin and progress.

The tetanus infection advances for from five to ten days undetected in the wound, the toxins develop unnoticed, cause their deleterious effect, and only after general poisoning has occurred is the disease detected.

The diphtheria infection starts on the surface, and before its toxins are fully developed and absorbed it is diagnosticated by the appearance of its exudate, the husky

voice or the nasal obstruction. At this time we could also arrest the tetanus infection. If we allow this time to pass by, then, as in tetanus, after the constitutional poisoning has taken place, the antitoxin is usually of no avail.

The hope is often expressed that we might avoid the disagreeable rashes which follow, in a certain proportion of cases, the injection of the antitoxic serum. We have no more hope now than we had five years ago of separating antitoxin completely from the horse serum.

In several directions we are making progress, however. By selecting proper horses we now obtain a serum much richer in antitoxin than before, and thus for the number of units required, less horse serum is injected. By further attention to the selection of horses, attention to their food, lengthening the period between the last toxin injection and the bleeding, and in other ways, such as drying and filtering the serum and separating from it the antitoxin in a chemically impure state, we may hope to obtain a serum which will give rashes less frequently than any now obtainable. In the dried antitoxin we have a preparation which will keep a long time when protected from the air, and which cannot become contaminated.

The dose of antitoxin should be from 1,000 to 3,000 units, according to the severity of the case and the age of the child. The dose is to be repeated within twelve to eighteen hours, if no improvement is noted and the case remains severe.

The following statistics show the absolute mortality in Berlin, Paris, and New York for the past ten years. It is worthy of note that investigation shows that the majority of deaths now occurring is among those not treated with antitoxin.

FROM STATISTICS TAKEN FROM THE OFFICIAL RECORDS OF BERLIN, PARIS, AND NEW YORK, ON FILE IN THE OFFICES OF THE NEW YORK HEALTH DEPARTMENT, THE FOLLOWING DEATH RATES FROM DIPHTHERIA AND CROUP, ESTIMATED AT 100,000 POPULATION, ARE GIVEN.

ABSOLUTE DEATH RATE PER 100,000 POPULATION.

Year.	Berlin.	Paris.	New York.
1886	125.7	73.2	187.5
1887	100.7	76.9	206.6
1888	76.1	83.7	167.7
1889	85.6	79.9	146.2
1890	102.0	77.5	110.6
1891	67.5	63.0	118.7
1892	92.9	63.6	123.3
1893	100.8	51.4	145.5
1894	86.7	40.7	158.5
1895	†59.7	17.7	105.2
1896	30.9	17.5	91.3
*1897	26.4	17.2	86.4

In children where the delay of danger is greatest, the antitoxin should be given immediately, as soon after diagnosticating the case as possible, and without waiting for the results of the culture to be reported.

Diseases Due to the Pneumococcus.—Typical lobar pneumonia, as well as certain forms of pleuritis, pericarditis, endocarditis, cerebro-spinal meningitis, abscesses, etc., are now known to be caused by the pneumococcus. Lobar pneumonia has a peculiar characteristic in that very frequently between the fifth and the eighth day a period arrives when all symptoms suddenly abate. This sudden cessation of the symptoms has been considered by many to be due to the development of an antitoxin or other curative substance in the blood. These persons therefore consider pneumonia to be peculiarly fitted for the serum treatment.

It is by no means certain, however, that this is the true

* Last quarter of year estimated.

† General use of antitoxin commenced.

explanation of the crisis. We have at least sufficient facts to make us doubtful. Other pneumococcus infections do not suddenly terminate in this way, nor is it seldom that pneumonias run an atypical course and persist or relapse. Other cases, again, have added to the pneumonia a pneumococcus septicæmia at the very time we should expect the development of curative substances. Experimental work on animals shows, also, that it is difficult to produce immunity by even repeated pneumococcus infections. Another fact, perhaps, bearing on the crisis is that the majority of pneumococci in cultures die after a life of five to seven days' duration, and it may well be that in the lung they find conditions develop, such as, for instance, an increase in acidity, which make the soil unsuitable for their growth, or at least for the development of their toxin. They thus die in the lung, without the blood itself containing any considerable amount of bactericidal substances.

Experimental work upon producing immunity in animals has been in progress since 1886, when A. Fraenkel found that animals which survived a pneumococcus infection possessed a certain amount of immunity. Foa, Klemperer, and others, about the years 1890 and 1891, found that injections, especially intravenous injections, of several centimetres of serum from immunized animals, would immunize them against a following moderate infection, and even cure them several hours after the first symptoms of fever have appeared. Other experimenters obtained only negative results from the same methods.

The serum used in over forty cases of pneumonia in man gave doubtful results, probably no curative and apparently no harmful effects.

The latest results published only a few days ago by Mennes (*Zeitschrift für Hyg.*, 1897, p. 426), give very favorable results. Rabbits, and later horses, were im-

munized by the culture fluid sterilized by heat, and then later by the virulent pneumococci. Many of the smaller animals succumbed in the process, but some became immunized.

The serum from these inoculated animals was, according to his statements, antitoxic, immunizing, and curative.

One-half cc. of serum injected in rabbits subcutaneously four hours before the injection of one hundred times a fatal dose of pneumococci gave protection. The fatal dose of pneumococci was 1-100,000,000 of a cc. Curative power was shown by reversing the injections, that is, giving the serum four hours after the infection, the controls dying in twenty-four hours, those injected with the serum living.

The serum finally was able to prevent the usual rise of temperature following an injection of several cubic centimetres of culture fluid obtained by filtering forty-eight hours bouillon cultures.

Very interesting experiments were carried out by Mennes in watching under the microscope the results of adding streptococci to the serum of immunized and non-immunized animals containing leucocytes.

In the non-immunized serum the leucocytes did not affix themselves to and draw the pneumococci into themselves in the slightest degree, while when the organisms were added to the immunized serum they were seized upon vigorously and within a few minutes entirely absorbed and destroyed.

Summing up the results here named, and others not mentioned for lack of time, we find that of a number of animals, some can be immunized, while others succumb.

The serum of some of the immunized animals has the power to prevent the development of a few organisms injected into the circulation, possibly by exciting the leucocytes to attack and destroy them.

The curative power is, however, very weak, and al-

though sufficient has been accomplished to make further investigation imperative, I do not feel that the serum is yet of practical value in the treatment of developed pneumococcus infections, nor do I feel certain that it ever will be. The serum is practically harmless, and I think physicians who desired to test it would be justified to use it in treatment upon the results of experiments already published.

Streptococcus Infections.—Streptococci, according to the degree and quality of their virulence, the region and method by which they gain entrance to the body, and the susceptibility of the tissues invaded, produce lesions of great variety in kind and gravity.

Thus, most forms of tonsillitis, erysipelas, cellulitis, abscess, and septicæmia, are due to streptococci, while other diseases, such as broncho-pneumonia, endocarditis, arthritis, etc., are also frequently caused by them alone or associated with other organisms.

In none of the streptococcus inflammations do we notice much apparent tendency to the production of immunizing and curative substances in the blood.

Severe general infections usually progress to a fatal termination after a few days, weeks, or months. It is true, however, that cases of erysipelas, cellulitis, and abscess, after periods varying from a few days to months, tend to recover, and to a certain extent, therefore, we may assume protective processes have been called forth. In these cases, however, we know from experience that faulty treatment would, as a rule, cause the subsiding infection to again progress, and that to perhaps a more serious extent than the original attack.

Koch and Petrusky tried a most interesting experiment. They inoculated cutaneously a man suffering from a malignant tumor with a streptococcus obtained from erysipelas. He developed a moderately severe attack which lasted

about ten days. On its subsidence they reinoculated him; a new attack developed which ran the same course and over the same area. This was repeated ten times with the same results.

This experiment proved that in this case at least little if any curative or immunizing substances were produced by repeated attacks of erysipelas, and that the recovery from each attack was due to local and transitory protective developments.

The severe forms of infection, such as septicæmia following injuries, operations, and puerperal infections, show little tendency to be arrested after being well established. Having then in remembrance the above facts, let us consider the results already obtained in the experimental immunization and treatment of animals and men suffering from, or in danger of, infection with streptococci. Two methods have been used for the immunization and attempt to produce curative substances in animals. Either the bouillon culture of a virulent streptococcus is filtered or heated to 55° C., so as to eliminate the living streptococci without altering the bacterial products, or the living virulent streptococcus itself is injected. Marmorek (*Annales Inst. Pasteur*, July, 1895) has probably given more attention to the production of a curative streptococcus serum than any other single person. For reasons which will be mentioned later I think we can get a clearer idea of the difficulties in the way of obtaining a streptococcus serum, and of estimating its value by considering some experiments carried on in the laboratories of the New York City Health Department. Dr. A. W. Williams, who has carried on these experiments, has kindly permitted me to quote a few of the results obtained by her.

Experiment A. Four rabbits received subcutaneously ¼ cc. of the serum of a sheep that had been immunized, and then immediately afterward a second injection in a

different portion of the body of one hundred times the average fatal dose of a very virulent streptococcus. These rabbits all remained alive. Two rabbits were injected as controls with simply the average fatal dose without the serum. These both died of septicæmia in two to three days. Three others received normal horse serum along with one hundred times the average fatal dose of streptococcus. These died as promptly as those receiving no serum.

The protective power of this sheep serum, as shown by repeated experiments, was uniform and unmistakable. Serum from the same animal two months later had, however, little appreciable effect. Also the serum taken from the same vials which had given us results in June was found to have very little effect in September. Serum given me lately by Marmorek himself, and considered by him to be of very high grade, proved when tested here two months later to be without appreciable effect against the streptococcus used by him to develop his serum. Some serum received from him one year ago apparently possessed slight immunizing power. Other experimenters to whom Marmorek has sent his serum have had similar results.

The streptococcus serums upon the market have all been tried by Dr. Williams, and none of them has shown any certain curative or immunizing power against our streptococcus. The most that the most active accomplished was to retard death in a certain proportion of cases. The rapid deterioration of serum in vials may account for the absence of curative power in the serums.

To estimate the present and future value of anti-streptococcus serum is a matter of the utmost difficulty. Many of the cases reported are of little or no help, because, on account of no cultures having been made, we are in doubt as to the nature of the bacterial infection. Even

when bacteriological examinations are made during life in cases of septicæmia, they are apt to fail to give us any information. Under Marmorek's supervision many cases have been injected; thus, even as far back as June, 1895, when his last statistics were published, he had treated 96 cases of scarlet fever, 411 cases of erysipelas, 16 cases of puerperal fever, and smaller numbers of cases of tonsillitis and of post-operative septicæmia.

Since then he has treated many forms of phthisis. In all these cases marked improvement is reported to have followed when they were due to streptococci. Thus, in 16 cases of puerperal fever, 7 were due to streptococcus alone. All these recovered. Three were due to the streptococcus and colon bacillus, and one to the colon bacillus alone. These four all died. In five streptococci were associated with staphylococci. Two of these died, three recovered.

In phthisis, where no cavities have as yet appeared, the fever and sweats lessened and all symptoms improved. He did not state that any cases were absolutely cured.

In the few cases, sixteen in all, of puerperal fever, wound infection, scarlet fever, and broncho-pneumonia, that I have seen under the treatment, the results have not been uniform.

In only two cases did I see results which appeared to be distinctly due to the serum. Both were cases of puerperal fever.

In one, treated at the Presbyterian Hospital, where chills had occurred twice daily for ten days, they ceased absolutely for two weeks, under daily doses of twenty to fifty cubic centimetres. The temperature, though ceasing to rise to such high elevations, did not average one degree lower than before the injections. The serum treatment was kept up for two weeks and then dropped. The case is still, after six weeks, running a high temperature.

In another puerperal case the temperature fell immediately upon giving the first injection of serum, and after two subsequent injections remained normal, and the case seemed greatly benefited. In neither of these cases, the one being treated at the Presbyterian Hospital and the other by Dr. Richards, could any streptococci or any other organisms be obtained from the blood. On bronchopneumonia I have seen absolutely no effect.

The results obtained here in New York by both physicians and surgeons have not on the whole been encouraging.

In some of the cases where apparently favorable results were obtained other bacteria than streptococci were found to be the cause of the disease. I believe that the following conclusions will be found to be fairly accurate:

The preparations of anti-streptococcus serum now on the market are either quite weak or entirely wanting in curative substances. We are justified in using serum only when it has been recently tested and shown to have some value in preventing infection in animals, and that we should, in so far as possible, establish the variety of bacteria causing the infection in every case in which the serum is used. The period during which a curative serum preserves its strength and the question as to whether the immunizing strength shown against one variety of streptococcus is equally effective against all streptococci, needs far more study.

The treatment of malignant tumors by the mixed streptococcus and prodigiosus toxins.

Fehleisen's discovery that an attack of erysipelas sometimes retarded the growth of sarcomatous tumors has been substantiated by several observers. In this country the experimental work upon this subject and the actual treatment of cases has been largely carried out by or under the direction of Dr. Coley. He has kindly sent me the following notes upon his results:

"The improvement and inhibitory action which the toxins have upon carcinoma have proved to be, in nearly all cases, but temporary, and in no case has the disease remained in abeyance sufficiently long to be regarded as cured.

"On the other hand, in sarcoma, which is the only form of malignant tumor in which I have advocated the treatment, sufficient time has elapsed to enable us to draw the following conclusions:

"The toxins injected subcutaneously into the tissues, either into the tumor substance or into parts remote from the tumor, exercise a distinctly inhibitory action upon the growth of all varieties of sarcoma. This action is the least marked in melanotic sarcoma, and thus far no cases of this form of tumor have disappeared under the treatment. The influence of the toxins upon round-celled sarcoma is much more powerful than it is upon melanotic, although distinctly less than upon the spindle-celled variety. A number of cases of round-celled sarcoma in which the diagnosis was unquestioned disappeared, and the patients have remained well beyond three years. Nearly half of the cases treated showed no appreciable decrease in size; the majority of the others which did show marked improvement at first, after decreasing in size for a few weeks, again began to increase and were no longer influenced by the treatment.

"In half of the cases of spindle-celled sarcoma treated by the toxins, the disease has disappeared entirely, and the majority of the successful cases have remained well sufficiently long to justify their being regarded as cured. It should be distinctly stated that all of the tumors under consideration were inoperable, as I have never advised treatment except in such cases.

"It is a curious fact, from the standpoint of pathology,

that the largest percentage of successful cases has occurred in the spindle-celled variety, the very one in which errors of diagnosis are practically impossible. In addition to microscopical examinations by the best of pathologists, the malignancy of the tumors was further confirmed by the characteristic clinical appearances, and in many cases by a history of repeated recurrences.

"My own successes have now been confirmed by a considerable number of other observers, among whom I will mention the two successful cases of Dr. John E. Owens, Professor of Surgery at the Northwestern University of Chicago; Attending Surgeon to St. Luke's Hospital. Before the Illinois State Medical Society, in June, he reported two cases—one a round, the other a spindle-celled sarcoma—in both of which cases he avoided amputating the leg by the use of the toxins, the tumors having disappeared under the treatment, and the patients both being well two years later.

"I have now three cases of spindle-celled sarcoma which have remained well beyond three years; one case of mixed (round and spindle) celled, which, after remaining well three and one-fourth years, had a return in the abdomen, and died about eight months later. This case certainly would establish the correctness of the early diagnosis."

Dr. Coley would be the first to acknowledge that even the very moderate claims put forward in this communication are disputed by many surgeons, they claiming that the disappearance of the tumors are due to other causes than the treatment. In spite, however, of the treatment being sometimes deleterious to the general health, and the occurrence from time to time of the spontaneous disappearance of apparently malignant tumors, I think we must allow that the proof is very strong that some sarcomatous tumors have been arrested and caused to disap-

pear by the toxin injections, and that where they are clearly inoperative and progressing the treatment should be tried.

Tuberculosis.—In all its varied manifestations in man and animals tuberculosis is now admitted to be caused by the tubercle bacillus.

Either at the commencement of the infection or at any stage in its progress other micro-organisms may become associated with the tubercle bacillus, and their deleterious effects may even predominate in importance.

An examination of tuberculous cases has shown that tuberculous diseases of the glands, bones, and joints frequently become arrested without treatment. The same is true probably in from ten to twenty per cent. of cases of pulmonary tuberculosis. Natural cure or arrest is, however, the exception rather than the rule in the majority when the lesions have advanced far enough for detection, nor can we state from experience that any permanent immunity is present in arrested cases. It is well known that many readily contract tuberculosis a second time. Koch believes that even and perhaps chiefly in the very worst cases a tendency to immunity is noted, for in miliary tuberculosis before death the abundance of bacilli is greatly lessened apparently by bactericidal influences.

The immunization process, if it is such, comes too late, however, to prevent the fatal termination.

The study of tuberculous processes in man, in spite of their subacute course, inclines us to approach the subject of treatment by injections of bacterial products or serums with but moderate hopefulness.

If by any means we can render the tissues slightly more resistant, or the fluids slightly bactericidal, we may be able to arrest or turn back an infection which would otherwise slowly progress.

Koch's Tuberculin.—The first preparation which was

made by evaporating at fairly high temperatures old tubercle cultures to one-tenth of their bulk, will probably be largely displaced by the new, except for diagnostic purposes.

The method of treatment and the results obtained from the old tuberculin are thus lately described by Koch:

After each injection, which should be large enough to cause a slight but not a great rise of temperature, a noticeable improvement in the tuberculous process follows. The amount of tuberculin injected is continually increased so as to continue the moderate reactions.

After several months all reactions cease, the patients having become immune to the toxin. Further injections are now useless until this immunity has passed. During the treatment the bacilli themselves have not been directly affected, and when the treatment is interrupted the tuberculous process is apt to progress.

Many cases, however, of pure tuberculosis become cured or greatly benefited by several periods of treatment.

The substances produced in the body by the old tuberculin neutralized the tubercular toxins, according to Koch, but were not bactericidal.

After a series of experiments he found the difficulty to be due to the nature of the envelope of the tubercle bacillus, which made it difficult to obtain the substance of the bacilli in soluble form without so altering it by heat or chemicals, that it was useless to produce immunizing substances.

He believes immunity is not produced in man, for possibly somewhat similar reasons, the bacilli never giving out sufficient toxin to cause curative substances to be produced.

The new tuberculin is a watery extract of the soluble portions of the unaltered tubercle bacilli. To prepare it the bacilli are dried in a vacuum, ground in an agate

mortar, placed in distilled water and centrifugalized. The sediment is removed, dried, ground again in the mortar, placed in sterile water, and again centrifugalized. The clear upper fluid containing the soluble portion of the bacilli is the new tuberculin. As can be readily seen, in a preparation thus made, contamination is difficult to avoid, freedom from intact bacilli is uncertain, and the strength of the solutions prepared at different times is variable.

Twenty per cent. of glycerin is added to preserve the tuberculin from contamination. More glycerin would precipitate the active immunizing substances.

With the old tuberculin, fever reaction was expected and necessary to obtain healing results. With the new it is unusual and not needed. The new tuberculin is said to be strongly immunizing, the old but slightly so.

The solution is supposed to contain in 1 cc. 10 milligrammes of solid substance. The initial dose is 1-500 m.g. To allow of accurate measurement the tuberculin is diluted with normal salt solution. The dose is gradually increased and is given about every other day. Temperature reactions of over ½° are to be avoided. The amounts increase in about two months up to 20 m.g. of solid substance, the full dose. After that, long pauses are allowed between the injections.

To immunize small animals, 1 to 2 m.g. are given repeatedly. When we look for the experimental work on animals, we are disappointed to find only a general account given.

Koch states that animals receiving large doses for two or three weeks before being injected with tubercle bacilli proved to be immune. Those treated with the tuberculin not later than two weeks after infection were cured. Treatment begun later was without avail.

He states, treatment in man must also be begun early.

Those far advanced, or those suffering from mixed infection, are beyond help from the new tuberculin. Those also whose temperature rises above 100.4° are as a rule unfit for the treatment.

In lupus cases and in cases of phthisis selected according to the above conditions, Koch has seen marked improvement in every case. No bad symptoms were noted in any. All gained in weight and appetite, and the physical signs improved.

As to other preparations of tuberculin, we are probably safe in saying that none of them is better than Koch's.

As we look at Koch's claims, we note first that he gives no hope of benefit in fairly advanced cases of pure tuberculosis, or in any cases where mixed infection has become marked. This excludes at once a large number of the cases when we first see them for treatment.

The curative results obtained in this country with the old tuberculin have been very slight. In some sanataria apyretic cases properly selected, have been treated with tuberculin with apparently some benefit. In private practice its dangers have been considered by most to be greater than its benefits. The new tuberculin is stated by Koch to be free from the dangers of the old, and also to give greatly increased curative results, that is, not only to neutralize the poison produced, but also to directly kill the bacilli, through the substances produced by the body-cells from the tuberculin.

As before stated, from the method of preparation we should expect that it would be extremely difficult to prepare uniform and sterile solutions. That prepared under Koch's personal supervision may have had these characteristics, but that sent out by the manufactory has neither of them.

Many reports sent out have shown that a patient showing no reaction from the solution contained in one vial

would have very severe and sometimes dangerous symptoms produced by the same quantity from a new vial.

Drs. Trudeau and Baldwin* have found the new tuberculin in the majority of vials obtained by them until the first of August, to be contaminated. Others have had similar experiences.

The above-named authors discovered that when the contents of the vials as obtained from the factory are centrifugalized many samples will be found to contain tubercle bacilli. Further, some of these bacilli are shown to be alive and capable of causing infection. Two out of five of the guinea-pigs which were being injected according to Koch's directions with the new tuberculin in order to test their immunity later against tuberculosis, were found to have developed tuberculosis from the bacilli contained in the tuberculin. The remaining three have since been inoculated along with controls, and have thus far shown no immunity.

When it is remembered that the bacilli from which tuberculin is made are highly virulent, the injection of them into patients is certainly a real objection to the treatment until such improvement in its manufacture shall be made as to insure its safety.

The reports from the other side are as yet conflicting. Lupus seems to be decidedly benefited, even more than by the old tuberculin. Some advanced cases, however, resist, and already some tendency to relapse has been noted. On phthisis, laryngeal tuberculosis, and other tuberculous processes, no definite opinion has yet been formed by many who have the best means for observation. Some report marked improvement in suitable cases, others little or none. All urge great care in increasing the dose injected, especially from new vials.

* *Med. News*, Aug. 1897

From Koch's reputation we certainly have reason to believe his statements and to hope that with such improvements as seem necessary to insure a sterile preparation, we may hope in the new tuberculin to have a real help in hastening the recovery of the more favorable cases.

The Serum Treatment of Tuberculosis.—The attempts to obtain from animals, chiefly horses, a serum which would be antitoxic or bactericidal, have been carried out along much the same lines as Koch's experiments upon man.

The methods adopted have been as follows:

Old cultures of tubercle bacilli grown in 5 per cent. glycerin bouillon have been filtered either with or without previous boiling and then injected into animals—this process being similar to Koch's, with his first tuberculin. Others have injected living virulent or non-virulent tubercle bacilli either alone or with their culture fluids. This, like Koch with his new tuberculin, being an attempt to get from the unaltered products and cell-contents of the bacilli the formation in the body of bactericidal or immunizing substances.

Since 1890 attempts have been made to treat human and animal tuberculosis by means of serums from animals thus treated.

Among the many claiming good results in man or animals are Hericourt and Richet, Bernheim, Maragliano, Viquerat, Paquin, De Schweinitz and Dorset, McFarland, and others.

The majority claim for their serum the power to neutralize the effect of tuberculin when injected into tuberculous guinea-pigs.

This test is insufficient and probably valueless since tuberculin is not the same as the unaltered products of the tubercle bacillus, and since it has been further shown

by Trudeau and Baldwin that other substances which have no specific properties whatever will have the same effect as the serum under certain conditions.

Some make the further claim that guinea-pigs injected with the serum acquire an immunity to the virulent tubercle bacillus, and that those already infected live longer than the controls which receive no serum, or, as Niemann (*Münch. Med. Woch.*, January 19, 1897), to be able to cure animals eighteen days after inoculation with a culture of tubercle bacilli which kills untreated pigs in fifteen weeks. Niemann also states that he has treated early cases of phthisis with good results. Very few observers have been able to obtain appreciable results with serums obtained from the different experimenters.

As in the treatment of other diseases it is difficult to arrive at the exact truth when we find the testimony so conflicting. A few weeks ago, when at Saranac Lake, I was shown the results of animal experiments with a number of serums whose manufacturers claimed them to be curative. None of them stayed the progress of the tuberculosis in the animals treated. They also showed me some clinical histories of certain patients free from mixed infection who received serum treatment. No results were apparent, either beneficial or harmful. The disease had continued to progress steadily in one of the cases where the lesions appeared to be those of pure tuberculosis, and where the patient was in good general condition.

From the information so kindly furnished me, I think that we must consider that most of the preparations of anti-tuberculous serum now on the market are little if any superior to normal horse serum.

As with the new tuberculin, so it probably is with the best of the serums, that they have feeble immunizing power, but that this power is so weak, and also perhaps

so transient, as to make it uncertain whether the slight results to be hoped for in a few favorable cases warrant us in urging the treatment. The treatment with both should, I believe, still be considered in the early experimental stage. With both the new tuberculin and the antituberculous serum we should try to observe the results with unbiased judgment, as it may well be that both will prove useful in proper cases.

Plague.—Upon the plague we may note that it is now known to be due to a specific bacillus, and that the infection is transmitted, not only by the infected bodies of diseased men, but also by rats, mice, and flies.

Roux, Yersin, and others have obtained from animals immunized by injections of the living plague bacilli, and by their toxins a serum which is quite antitoxic and bactericidal.

From one-tenth to one-fortieth of a cubic centimetre of the serum prepared by them immunized mice against ten times the fatal dose of toxin or of the living virulent bacillus.

Of 500 exposed persons receiving preventive inoculations of the serum, only five contracted the disease, of which three died.

This serum is sufficient in a dose of 10 cc. to protect monkeys from infection, and in 20 cc. to cure them two days after an inoculation. The plague runs a course in monkeys very similar to that in man and kills the animals about five days after infection.

The mortality among 149 cases of the plague in man treated by the serum was 49 per cent., against about 80 per cent. in untreated cases. In those treated in the first stages some of the results were very striking. It is only fair to state that this serum was very weak, having been sent by Roux because of the urgent demand for it.

A stronger serum prepared on the spot by Yersin gave

much better results in a very limited series—only two deaths in twenty-six cases.

Haffkine's treatment, by injecting the dead bacilli into man, was tried on 1,300, who were exposed to infection. Twenty-five of this number contracted the disease and died. As compared with an equal number of persons exposed to the same conditions, some immunity seemed to have been produced by the treatment. The symptoms following the injection were of fever and prostration, lasting, as a rule, one to two days. Exceptionally, the symptoms continued a week and were quite severe.

Typhoid Fever and Cholera.—Infections due to the typhoid bacillus and the cholera spirillum may be considered together for the results obtained in the immunization of animals by the injection of dead or living bacilli have been similar. Animals can be immunized to both organisms, and their serum will be found to contain feeble antitoxic and moderate bactericidal properties.

Pfeiffer injected three men with dead typhoid bacilli according to Haffkine's method, in cholera and the plague, and found that curative substances developed in the blood after the lapse of a number of days.

We should judge from animal experiments that the injections of the serums, or of the dead bacteria, into man would produce a fair degree of immunity for some weeks.

The treatment of typhoid fever and cholera with serum injections has not shown any marked results, although a few observers have claimed the disease to have been shortened.

Hydrophobia.—Although no form of micro-organism has yet been discovered in the brain or spinal cord of men or animals attacked by hydrophobia, nevertheless, we are certain that one exists, for the disease is so certainly transmitted from animal to animal in characteristic form that scepticism is impossible.

The preventive treatment, instituted by Pasteur, has been subjected to an immense amount of criticism, but I believe its efficacy is to-day fully established. Two objections have been made to the treatment. One, that the proportions of cases developing after being bitten, was as large in those treated as in those not treated; and second, that some who would not have developed hydrophobia from the dog's bite developed it from the injections of the virus.

As the Health Department intends soon to offer the Pasteur treatment to all who desire it, these criticisms have naturally interested us greatly.

During a visit at the Pasteur Institute in Paris, this summer, I carefully inquired concerning these points. It was stated to me that the apparent diminution in the percentage of those developing hydrophobia, after bites by rabid animals, was so great that it was impossible to believe it was due to misinformation as to the extent it formerly occurred.

They stated, however, as an interesting fact, that from time to time a person infected developed rabies two weeks or more after having passed through the whole course of treatment, that is, at a time when the immunization should have been at its height.

As to the possibility of producing hydrophobia by the injections, they believed it had never occurred in the thousands of cases treated at the institute. Similar testimony comes from all the other institutes.

In order to test experimentally the immunizing value of the Pasteur treatment, numerous experiments have been carried out in the Research Laboratory of the Health Department by Drs. Wilson and Cabot, assistant bacteriologists.

These, though not yet completed, show striking evidence that the injections do produce immunity, and that

when properly carried out they are without danger, even in very susceptible animals.

The following report of a series of experiments carried out by Dr. Wilson have been kindly furnished me by him as an illustration, and are very instructive.

Experiments on guinea-pigs with the preventive treatments of rabies :

No. of pigs receiving Pasteur's treatment without subdural inoculation :	7	Deaths	0	Surviving	7
No. of pigs receiving subdural inoculation without treatment :	5	"	5	"	0
No. of pigs receiving subdural inoculation with preventive treatment prior to subdural inoculation only :	8	"	7*	"	1
No. of pigs receiving inoculation into the posterior chamber of the eye ; without preventive treatment :	2	"	2	"	0
No. of pigs receiving inoculation into the posterior chamber of the eye ; receiving preventive treatment :	6	"	3*	"	3
No. of pigs receiving preventive treatment both before and after subdural noculation :	3	"	0	"	3

So far as is known to the speaker there are no other diseases in men besides those already mentioned in which bacterial products are of any practical therapeutic value. The advances in our knowledge concerning the relation of bacteria to disease have aided our efforts to avoid the communication of disease more than to prevent the development of an infection already acquired, and to arrest the progress of an infection more than to cure the disease when established.

Thus, because of our knowledge of the infectious nature of the intestinal discharges of cholera and typhoid-fever patients, of the sputa of consumptives, and of the secretions of convalescent cases of diphtheria, we are able to take much more successful precautions against the spread of these diseases than formerly. The surgeon and obstetrician also realize now not only the danger of bacterial infection, but how to avoid it.

* Death delayed.

Such measures as the extinction of tuberculous cattle and the pasteurization of milk enhance the purity and wholesomeness of our milk supply.

When infection has already taken place, but no lesions have developed, we are able in many instances to produce immunity, and thus prevent the development of the disease, as, for example, in hydrophobia, small-pox, diphtheria, etc.

When the disease has become established, our resources are fewer, diphtheria, tetanus, and the plague being the only ones where we can be fairly sure of results from serum treatment.

Much surgical treatment, however, really owes its value to its influence upon the bacterial infection. By removal of infected pus, relief of tension in the tissues, and by other means, surgeons prevent, arrest, or remove a streptococcus, anthrax, tuberculous, or other infection.

As to the future, the outlook is bright for obtaining through serums or through the toxic substances of the micro-organisms themselves means for immunizing against most, if not all, of the diseases due to micro-organisms.

This immunity in most diseases due to bacteria will not be, however, of long duration. This drawback can be overcome by repeating the inoculation.

When we have discovered the micro-organisms causing scarlet fever, measles, and the other diseases in which a prolonged immunity follows recovery from infection, we may hope to obtain vaccines as efficient as that now used in small-pox.

The prospect of obtaining serums which will promptly arrest the further development of diseases already established by the destruction of the micro-organisms and their poisons already existing in the body, is rather less encouraging than it appeared to be shortly after the discovery by Behring of the diphtheria antitoxin.

We must remember that all we can hope for is to stop all growth of the micro-organisms and prevent further action of the bacterial poisons at the moment when we treat the case. We cannot hope to beneficially affect the tissue-cells or the activity of organs, except that by obliterating certain deleterious products we allow the body processes and other therapeutic helps a better field for success.

From the fact that we have obtained from bacterial products a number of substances each of which inhibits in the body the growth of some one species of bacteria without affecting other bacteria or the tissue-cells, it seems to me a possibility, though perhaps not a probability, that some time in the future we may find chemical substances which will have these specific bactericidal properties.

In closing, I wish to speak a word of caution as to the indiscriminate use of the various so-called antitoxic serums.

The different preparations of diphtheria and tetanus antitoxins are, for the most part, reliable and up to the strength claimed for them.

The other serums are, however, for the most part unreliable, either because, as in the case of anti-streptococcus serum, they lose in a few weeks the feeble immunizing substances which they at first perhaps possessed, or as in the case of anti-syphilitic serum, they probably never had any virtue whatever.

Experimental work upon the development of immunizing serums and bacterial products is necessarily very expensive and cannot be carried on with the hope of any financial profit. We must look, therefore, for the necessary means to carry on this work, so important for the welfare of mankind, to national or city governments, or to private laboratories, such as exist at a few of the greatest universities.

MEMORIAL ADDRESS ON WILLIAM THOMPSON LUSK.

DELIVERED BEFORE THE ACADEMY OF MEDICINE, 1897.

BY DR. A. ALEXANDER SMITH.

Dr. William Thompson Lusk was born May 23, 1838, at Norwich, Conn. He spent his boyhood days at Norwich, attending the Rev. Albert Spooner's school, with a view to preparation for Yale College. His uncle examined him in Latin, and told him that although well taught, it was by the old method; and that if he tried to enter Yale College on that preparation he would be rejected. Accordingly, leaving Norwich in the winter of 1853–1854, he attended Anthon's Grammar School in Murray Street, New York City, residing in the family of Dr. and Mrs. Fordyce Barker, to the latter of whom he was related by marriage. The winter of 1854–1855 he was sent by his mother to Russell's Military School in New Haven, because of "the great advantage which he will derive from thorough physical training in the gymnasium." In 1855 he entered the Freshman class at Yale College, but remained only one year, leaving college because of difficulty with his eyes. Later, in 1872, he was enrolled with his class by the action of the corporation, and then received an honorary degree of A.M. Later still, in 1894, Yale conferred on him the honorary degree of LL.D.

For one year after leaving college he engaged in business, but his eyes continuing to trouble him, and having no liking for business, in 1858 he went abroad, to consult a distinguished oculist, Dr. Mannoir, at Geneva. He had become much interested, even in boyhood, in the study of chemistry

and physiology, and after a short stay in Geneva, he went to Heidelberg and began the study of medicine, his interest in chemistry and physiology leading to such decision. He remained in Heidelberg two years, and one year in Berlin, coming home to America in 1861 to enter the army. Governor Buckingham of Connecticut offered him a position on his staff, but the young man, wishing assured active and immediate service, enlisted as a private in the Seventy-ninth Highlanders, New York Volunteers. His wish was soon gratified, for, joining the regiment in June, 1861, he took part in the battle of the first Bull Run, though not yet mustered into service. At this battle he carried his wounded captain off the field, going backward that he might not be shot in the back if a bullet should strike him. He was commissioned second lieutenant in the Seventy-ninth Regiment September 19, 1861, with rank from August 3d. He was commissioned captain February 24, 1862, with rank from January 19th. He resigned February 28, 1863, at the request of Governor Morgan, to take command of a regiment then recruiting in New York City. Before the regiment was filled he joined the staff of General Daniel Tyler, and was commissioned assistant adjutant-general, with rank of captain, July 26th. While in the service of the United States he took part in the battles of Blackburn Ford, First Bull Run, Port Royal, Secessionville-on-James Island, Second Bull Run, Chantilly, South Mountain, Antietam, Fredericksburg, Manassas, and many minor engagements. Of the battle of Manassas he writes: "I made the charge armed with a ramrod, which I had picked up on the way thither. I acknowledge that I found the work hotter than I anticipated."

General Isaac I. Stevens, in his official report of the battle of James Island, S. C., in June, 1862, writes: "My assistant adjutant-general was in all parts of the field carrying my orders and bringing me information, to the great

exposure of his life, as was Aid Captain Wm. T. Lusk." And at the battle of Antietam, in September, 1862, as acting assistant adjutant-general of Colonel Christy's brigade, his name is recorded as among those mentioned for gallant and meritorious conduct in the field, and for efficiency in their departments. He served as staff officer on General Isaac I. Stevens's staff for a considerable period of time preceding the latter's death in the summer of 1862.

During the draft riots in New York City in 1863, Captain Lusk commanded two companies of troops, and was stationed at Eighth Avenue and Twenty-third Street. During his service in the army he had two horses shot under him, once had his belt shot off, and saw his Seventy-ninth Highlander regiment of 1,000 men reduced to 230 in number, yet himself never received a scratch. He resigned September 17, 1863, when his troops were sent into Delaware and put on the inactive list.

After his resignation he came to New York and completed his medical course at the Bellevue Hospital Medical College, graduating in 1864, and was valedictorian of his class. He went abroad in May, 1864, for further study, spending four months in Edinburgh with Sir James Simpson, six months in Paris, four months in Vienna with Carl Braun, and two months in Prague with Seifert. On his return from Europe in 1865 he went to reside in Bridgeport, Conn., where he became associated with Dr. Robert Hubbard, from whom he claimed to have learned much of the art of how to practise medicine. In 1866 he came to New York and became associated with Dr. Fordyce Barker, which association continued until 1873.

In 1869 he was made "Professor of Physiology and Microscopic Anatomy" in the Long Island College Hospital. This position he held until 1871.

In the winter of 1870–1871, at the request of Dr. Oliver Wendell Holmes, he delivered a course of lectures on Physi-

ology at the Harvard Medical School. This course was very successful, and he was led to expect an immediate appointment to the chair. There was, however, a little delay, during which time he was offered the chair of Obstetrics and Diseases of Women and Children at the Bellevue Hospital Medical College, made vacant by the death of Dr. Geo. T. Elliot. This latter he accepted at once, and a few hours later came the offer from Harvard, which, of course, was declined. Through this incident New York became his permanent residence instead of Boston. He held the chair at Bellevue Hospital Medical College up to the time of his death, June 12, 1897.

In 1870 he was appointed visiting physician to the Nursery and Childs Hospital and to Charity Hospital. In 1871 he was appointed obstetric surgeon to Bellevue Hospital.

From 1871 to 1873 he was coeditor with Dr. James B. Hunter, of the New York *Medical Journal.*

From 1889 to 1897 he was President of the Faculty of the Bellevue Hospital Medical College.

Other positions and titles he held or had held were:

Consulting physician to the Maternity Hospital and to the Foundling Asylum.

Consulting obstetrician to the Society of the Lying-in Hospital of the City of New York, visiting obstetrician to the Emergency Hospital, gynæcological surgeon to St. Vincent's Hospital, President of the American Gynæcological Society, Vice-President of the New York Obstetrical Society, President of the New York State Medical Society, Honorary President of the Obstetrical Section at the Berlin Medical Congress, Honorary Fellow of the Edinburgh and London Obstetrical Societies, Corresponding Fellow of the Obstetrical Societies of Paris and Leipsic, Corresponding Fellow of the Paris Academy of Medicine.

He was also a member of the military order of the Loyal

Legion of the United States, with title of captain, assistant adjutant-general, United States Volunteers.

Dr. Lusk was the author of many papers on various medical subjects, chiefly on obstetrics and gynæcology. He evinced his interest and training in physiology by occasional contributions on that subject. A paper on "The Histological Doctrines of Robin," a paper on "Uræmia, a Common Cause of Death in Uterine Cancer," and still another on "Origin of Diabetes, with Some New Experiments Regarding the Glycogenic Function of the Liver," all attest this, and were published in the New York *Medical Journal* during the time he was one of the editors.

A paper entitled "Nature, Causes, and Prevention of Puerperal Fever," read before the International Medical Congress in 1876 in Philadelphia, was one of the first in support of the germ theory of disease, which then created considerable interest. When Koch's paper appeared in 1882 on the isolation of the tubercle bacillus, Dr. Lusk accepted its conclusions enthusiastically, regarding such conclusions as offering the only satisfactory scientific explanation of the origin and spread, not only of tuberculosis, but also of many other diseases.

The first edition of his monumental work, "The Science and Art of Midwifery," appeared in 1882, and has gone through four editions. The last edition, published in 1892, Dr. Lusk regarded as practically a new book, it having been largely rewritten. In 1895 he appended a chapter on symphysiotomy. It was his intention, during the summer of 1897 to revise the book again and issue a fifth edition.

The work has been translated into French, Italian, Spanish, and Arabic.

When the book was about to be issued, the plan of it was submitted to an eminent obstetrician of New York, whose opinion was highly valued by both author and publisher, and whose criticism was that it would certainly fail of suc-

cess unless the plan were changed. Dr. Lusk refused to change the plan and said: "It must go before the profession on its merits without such change." A few months after it was published the writer of this address asked him as to the sale of it. His response was quite characteristic of his well-known modesty. "As well, quite as well, probably, as it deserves; there are still 400 copies unsold. I am desirous of issuing a second and, as I think, a much improved edition." Within a few days, on meeting him again, he said: "The second edition must come out at once; the publishers have just received an order from London for 900 copies."

This work added greatly to his reputation, both at home and abroad. While its trend is decidedly German, the clinical aspect of it is the result of New York practice.

Dr. Lusk married May 4, 1864, Miss Mary Hartwell Chittenden, daughter of Mr. S. B. Chittenden of Brooklyn. She died in 1871. Of this marriage there were born five children, one of whom died in infancy. Two daughters and two sons survive. One son, Graham, is professor of physiology in the Medical Department of Yale University, and the other, Wm. C., is a practising physician in this city.

He married again in 1876 Mrs. Matilda Thorn (*née* Myer), who died in 1892. Of this marriage a daughter survives.

Dr. Lusk's eminence as an author, a teacher, and a practitioner, made his name well known. His charming personality and his genial, hearty manner brought him many friends. Modest as to his own attainments, he was ever ready and cordial in his praise of the work of others. He was a loyal friend and a generous antagonist. He was sometimes impulsive, but always just and magnanimous. He was sincere and unselfishly devoted to duty, qualities which always command respect and admiration. No efforts were too great for him when suffering called for his services;

indeed, he often worked for others, to the detriment of his own health. He was ever ready to take responsibility when necessary, but he was always conservative in his judgment.

With his colleagues in college work, he was always the affectionate and warm-hearted colaborer, and intensely interested in it.

He was the counsellor and friend to young men.

Well might be applied to him the sentiment he expressed in the dedication of the first edition of his book to Dr. Fordyce Barker: "Generosity toward the younger members of the profession."

SANITARY SCIENCE, THE MEDICAL PROFESSION, AND THE PUBLIC.

ANNIVERSARY DISCOURSE, NOVEMBER 18, 1897.

BY HERMANN M. BIGGS, M.D., OF NEW YORK.

In an address on public medicine delivered before the British Medical Association some years ago, Sir Charles Cameron referred to a writer in the *Scotsman* who objected to the appointment of medical men engaged in practice as officers of health, on the ground that "no sane body of men can bring themselves to believe that medical practitioners, whose livelihood depends upon sickness, are likely to exert themselves in exterminating it." Dr. Holmes once humorously said, "Physicians desire for their patients great longevity with frequent illness." To such an audience as this arguments or proofs are not necessary to refute these suggestions.

The history of sanitary science is indissolubly related to the history of medicine, and its achievements may almost be written in the recital of the work, investigations, and discoveries of medical men. It may perhaps be justly said, that no class or profession has contributed as much as the medical profession to the advance of civilization, to the prosperity of nations, and to the preservation and prolongation of human life. All of this is closely related to the vast contributions to the progress of civilization which have been made by sanitary science. Sanitary science aims to prevent disease. In former times at least four-fifths of all deaths were due to preventable causes, and even now, when the death-rate has been reduced to a quarter of what it once was, still one-third of the

deaths occurring in our large cities are due to distinctly preventable diseases.

During a discussion in the British Parliament of a bill for the protection of the public health, one of the greatest English ministers, Disraeli, pronounced these memorable words, "The public health is the foundation on which repose the happiness of the people and the power of a country. The care of the public health is the first duty of a statesman." England has long and justly been regarded as the birthplace and home of sanitary science. English methods in sanitation have been the models for the world. No other country has had in modern times so high a standard of public health and such low death-rates. These conditions have, without doubt, largely contributed in placing the British nation foremost in civilization, and have assisted much in laying the foundation of, and in building up, the British empire, in which is included to-day nearly one-quarter of the world's population. Such results are, in part, the logical and far-reaching consequences of broad statesmanship in sanitary matters.

So complex are the relations, that it is impossible, even after the most careful consideration, to gain an adequate conception of the vast influence which the health of a nation has upon its material prosperity and its standard of morality. We realize more fully how close is the relation of the public health to the material prosperity of a community, when we recall the deadening influence on business and commerce produced in 1892 by the appearance in New York Harbor of several ships, each with a few cases of Asiatic cholera on board, and the occurrence of a dozen cases in New York City itself. Almost a panic was created among the more fearful of the inhabitants. All the Southern, Central, South American and Mediterranean ports were quarantined against New York, and but for the short duration of the outbreak a most serious interference with commerce would have resulted.

The appearance at that time of cholera in Europe and in New York was the result of sanitary neglect. We realize how dearly this was paid for, when it is remembered what the epidemic of cholera in 1892 cost the city of Hamburg. Can one by any stretch of the imagination conceive of the terrible results which would follow the extension of such an epidemic to a number of the large cities of Europe and the United States, or over the whole continent of Europe, as occurred in the great epidemics of earlier times? Consider the results which only this year followed the introduction, even at the end of the season, of yellow fever into some of the Southern cities. The material loss has been enormous, although the actual number of deaths has been comparatively insignificant. The expenditure, on sanitary and quarantine improvements, of one-tenth of the loss involved in this insignificant epidemic would render another introduction of yellow fever well-nigh impossible. With the numerous close and rapid lines of communication which now exist between all parts of the civilized world, the rapidity of extension of one of the mediæval epidemics would be frightful to contemplate, should sanitary conditions and lack of sanitary knowledge render such an epidemic possible. In temperate climates we have no longer reason to fear the occurrence of epidemics of any diseases more terrifying than scarlet fever, measles, typhoid fever, and diphtheria, and the occurrence of an epidemic of any one of these is to be chargeable to remediable sanitary defects.

The public health bears quite as close a relation to public morality as to general material prosperity. Sickness brings in its trail, especially among the poor, uncleanliness, poverty, misery, wretchedness, destitution, and death. The physical and the moral man are interdependent. That which degrades one, degrades the other; individual exceptions to the rule do not invalidate its force.

The most casual review of history shows in a striking

manner the extraordinary improvement which has taken place in the public health in modern times. The plague and the other great epidemic diseases of the Middle Ages, which decimated and sometimes well-nigh exterminated the human race, are vanquished; small-pox, typhus fever, epidemic dysentery, and cholera have been restricted to the narrowest limits. The prevalence, in temperate climates and under favorable sanitary conditions, of yellow and typhoid fever has been diminished to a small fraction of what it formerly was. Diphtheria and hydrophobia are now absolutely preventable, and even the less alarming, because more familiar, but hardly less fatal diseases, measles, scarlet fever, whooping-cough, and summer diarrhœa—a formidable array of preventable affections—have been confined by the energies of the sanitary authorities within much narrower boundaries. The great plague of modern civilization, tuberculosis, shows a steady and continuous decline in its death-rate, and the most gratifying improvement in the percentage of recoveries from it, as the result of improved general and personal hygiene. Small-pox, in former times with all its terrors, before the discovery of vaccination, was scarcely more to be dreaded than tuberculosis is even now. Small-pox then caused a relatively smaller proportion of deaths than tuberculosis does to-day. We are all familiar with pulmonary tuberculosis. It is seen everywhere; it occurs among all classes of the population. It is insidious, and extends slowly; it is not dramatic in the manner of its appearance or course. As it is so familiar to everyone, we do not fear it. We neglect it; and many would deny proper sanitary supervision and refuse to provide special hospitals for the care of the poor suffering from it. Therefore, its ravages still continue, and it causes nearly one-seventh of all deaths, and nearly one-fourth of all deaths among the adult population, although, be it remembered, no disease is better understood or more preventable; none more amenable to sim-

ple and easily applied measures of cleanliness and disinfection. A consumptive may be absolutely free from danger to his immediate family and to his most intimate associates, provided only simple precautions be observed.

But at last we may hope that light is breaking upon sanitary authorities, the medical profession, and the people. Rational measures of prevention are taking the place of insane fear, or helpless, hopeless, ignorance and neglect, and before another generation has passed away the death-rate from tuberculosis in cities under the best sanitary control will, I believe, be less than one-third what it is in New York to-day. I do not wish this statement to be received as the opinion of an enthusiast; but as the deliberate conviction, reached after most careful and prolonged consideration and study, of one who has had considerable experience in sanitary matters and exceptional opportunities for the investigation of this dread disease.

The diminution in the number of deaths occurring from all causes in proportion to the population is shown in the most striking way when we compare the present with previous conditions. The healthfulness of a community or locality is to be judged by the statistics of the number of cases of sickness and death considered in relation to their causes. The condition of the public health should be studied, not simply with relation to the number of deaths, or number of cases of sickness, in proportion to the population, but also with relation to the nature and preventability of the diseases which cause the morbidity and mortality. The mortality is usually expressed by stating how many persons die each year to each thousand of the population. In the seventeenth and eighteenth centuries the average annual death-rate per thousand living, throughout the civilized world, probably varied from 50 to 80, that is, of every thousand persons in the population 50 to 80 died each year. The average duration of life of each person born was not more than

fifteen to eighteen years. From 1628 to 1635, in London—these years being free from pestilence—the average death-rate was 50 per thousand, and the absolute annual mortality for twenty-four years, from 1620 to 1643, inclusive, was nearly 80 per thousand. With what incredulity would the prediction have been received two hundred years ago that the then average annual death-rate of 80 per thousand in England would be reduced at the present time to 17. The mortality during 1894 in London was only 17 and a fraction, or less than one-quarter of that of two hundred years ago. The mean expectation of life at birth one hundred years ago in London was only about nineteen years, the annual death-rate being 51 or 52 per thousand. At the end of the first half of this century it had already diminished more than one-third, to an estimated 30 or 35 per thousand, and as the century draws to an end it has diminished again to only 17 or 18, and the average duration of life has increased to more than 40 years, or more than doubled during the century. From 1770 to 1780 small-pox alone caused a higher annual death-rate in London than diphtheria, croup, consumption, and all other tuberculous diseases, measles, small-pox, scarlet fever, and typhoid fever together caused in New York last year. Fever at the same time caused an even greater death-rate, and in the sixteen-century plague, cholera and dysentery, diseases which are now practically extinct, annually destroyed nearly twice as many of each thousand of the population as now die from all causes added together. More than 40,000 people died in Paris during one epidemic of small-pox in the last century, and a third of the population of Iceland in another. Ten per cent. of the population of a city or country were often destroyed during one epidemic.

It is perhaps desirable to define more specifically what is meant by infectious, contagious, or communicable disease. Infectious diseases are those caused by some simple form of animal or plant life, which possesses, under favorable condi-

tions, unlimited powers of reproduction. The contagious diseases include those infectious diseases which are transmitted by contact or proximity to the infected individual or infected materials. For convenience we refer to another class of the infectious diseases as communicable, in distinction from the contagious, because the susceptibility is less general and the means by which they are transmitted are well understood.

In the communicable diseases the observation of simple measures of prevention almost entirely robs them of danger to others. This is not true of the contagious class, which includes small-pox, scarlet fever, measles, chicken-pox, whooping-cough, and typhus fever. The communicable diseases include diphtheria, typhoid fever, tuberculosis, cholera, and some others of less importance, in all of which it is possible to reduce to a minimum the danger of transmission by the observation of simple measures. In diphtheria the germs causing the disease are contained solely in the discharges from the nose and mouth; in typhoid fever and cholera they are contained only in the discharges from the stomach or intestines; in pulmonary tuberculosis, or consumption, only in the expectorations. It at once becomes evident that very different measures of prevention are to be adopted in these different diseases. In the contagious class, it should be said, we are as yet unable to adopt any measures which will protect an exposed and susceptible individual.

The most serious array of preventable diseases with which we have at present to contend are those which are highly contagious, such as measles, scarlet fever, and whooping-cough, and a group of infectious diseases, partly communicable, such as diphtheria, typhoid fever, summer diarrhœa, tuberculosis, pneumonia, influenza, and some other affections of the respiratory tract. In all the diseases of this list there has been a constant decrease in frequency of occurrence, excepting diphtheria, pneumonia, and the epidemics of influ-

enza. Diphtheria had been gradually increasing for a number of years in all of the larger cities until the discovery of the diphtheria antitoxin in 1894. With the extensive use of this remedy the mortality from it commenced to diminish rapidly, and in Berlin and Paris the death-rate from this disease has been reduced to almost one-quarter of what it previously was. Much has also been accomplished in New York, a diminution of forty per cent. in the death-rate having taken place since 1894. The constant increase of diphtheria in the large towns was a remarkable and inexplicable fact, until the observations first made on a large scale by the New York City Health Department showed how it was disseminated through the diphtheria bacilli present in the throat during convalescence and in health.

In the control of whooping-cough, measles, and scarlet fever, exceptional difficulties must be contended with, especially in the great tenement-house population of New York. These diseases possess many features in common. In no one of them is the cause known, and, therefore, the difficulties in their control are greatly increased. These difficulties arise in part from the great crowding in our tenement-house districts, and in part from the fact that they are regarded by the ignorant as only children's diseases, and consequently inevitable. They are, therefore, neglected, and, as a result, being excessively contagious, are prevalent and familiar, and each year unnecessarily destroy many hundred lives in this city—more than ten times as many as small-pox and cholera together; yet there is more dread of the latter two diseases than of all other zymotic combined.

I believe that much could be done to reduce the death-rate from the diseases under consideration if they were managed in an efficient and intelligent manner and with a genuine determination to restrict and prevent them. Probably a satisfactory result will only be attained by the education of the masses, so that they will be able to estimate the actual danger

attending these diseases. This opinion as to the possibility of their prevention is justified, as has been shown by Dr. Hill, Medical Officer of Health to Birmingham, by the success which has attended the measures taken in that city with regard to scarlet fever. In Birmingham the annual average death-rate during three periods—1875 to 1878, 1878 to 1882, and 1883 to 1889—has been reduced from 425 per 100,000 to 235 and to 72; during the last period, the number of deaths being only about one-sixth as many as during the first. This reduction has been ascribed to the compulsory reporting of cases and to the hospital accommodations which have been provided for the care of patients with this disease. During 1875 only 20 cases of scarlet fever were admitted to the hospital. In 1889 this number increased to 3,759. During the intervening period the decrease in the prevalence of the disease was coincident with the knowledge obtained of the occurrence of cases, and the extent to which the public availed themselves of the advantages of hospital care.

It is said by Dr. Hill that "the prejudice against hospital treatment, which was general at first, has mostly disappeared, and the public now appreciates the advantages to health and life of an institution which enables patients to be removed from unhealthy rooms and other unfavorable conditions to a properly equipped hospital, where better air, suitable food, superior medical treatment, careful nursing, and all those appliances are at hand which a hospital affords, but which are wanting in the homes of the poor." The mortality of the disease in the hospitals varies from five to six per cent. It is noted also that "the social and professional objections to the act controlling the notification of infectious diseases have been proved to have had no foundations whatever. The distrust and friction between the practitioner and the medical officer of health, which were predicted, have not appeared; the concealment of disease which was to have followed has not occurred; the sacred confidence between patient and doc-

tor, which was to have been destroyed with most disastrous results, remains inviolate. And so every theoretic objection which timidity, selfishness, or ignorance could find or invent has been refuted by practical experience.

"One of the objections put forward in this matter, and which deserves special comment, was that notification would be useless in the absence of isolation hospitals. Without seeking to refute this assertion, which, however, would not be difficult, it may be said that to make compulsory the notification to the sanitary authorities of cases of infectious disease which ought to be isolated constitutes one of the strongest inducements to provide hospitals for their care. These follow as a natural sequence. Every town should provide at least one bed in such a hospital to every thousand of its population.

"The past triumphs of preventive medicine have been achieved in relation to the majority of the scourges afflicting mankind through cleanliness. Malarial fever, small-pox, and hydrophobia have yielded to different and special influences, but the plague and the mediæval epidemics have been banished by cleanliness. Typhus and cholera, which formerly wrought such terrible havoc where filthy conditions prevailed, have disappeared through the influence of cleanliness. Typhoid fever is becoming less common through the improved cleanliness and better water supply of our cities; and while filthy conditions do not seem to give rise to measles, whooping-cough, scarlet fever, and diphtheria, yet there can be no doubt that they seriously aggravate their severity. Nevertheless, the old lesson of thousands of years ago is still unlearned. The sanitarian must still go forth and try to teach that without cleanliness health is impossible."

A Royal Commission, appointed to inquire into the sanitary condition of the British army in India in 1859, found that during a long period the annual average death-rate had remained 69 per thousand. The inquiry resulted in exten-

sive improvements in the housing, clothing, food, and occupation of the soldiers. After these were carried into effect there was a steady decline in the death-rate, the rates for 1886, '87, and '88 vary between 14 and 15.2 per thousand, or less than one-fourth of that previously prevailing; in some years the rate has been even lower.

The impetus to modern sanitary progress may be said to have commenced in England with the passage of the Public Health Act of 1875. Since that time there has been a diminution of twenty per cent. in the death-rate for the whole of England and Wales, while in certain individual communities the fall has equalled thirty per cent., and in Maidstone the unusual figure of forty per cent. has been reached. In New York City, in more recent years, an equally great reduction in the death-rate has been obtained in a shorter period. The average annual death-rate for the ten years ending in 1893 was about 26 per thousand of the population, while the present year will show a death-rate of only 19 and a fraction—a reduction equalling about twenty-five per cent. since 1893. The improvement in New York is especially notable, because it has not been the result of, or associated with, any single great public work or improvement, such as the introduction of a purer water supply or a better system of sewerage, but is the result of a gradual improvement in every respect in the general sanitary conditions—the improvement in the character of the housing of the poor, the condemnation of rear tenements, the prevention of overcrowding and the habitation of basements and cellars; the improvement in the character of the pavements, and in the cleaning of the streets; the improved character of the water supply, through a better control of the water-shed; a closer supervision of foods, attained by a rigid inspection of meat, fish, and fruit, and the precise control of the milk supply; the inspection and supervision of offensive trades; the application of modern scientific discoveries in the supervision and control of infectious diseases, and the edu-

cation of the people in all matters connected with general and personal hygiene.

While the splendid results which have been obtained may well serve for congratulation, it is not to be supposed for a moment that the limit of the improvement has been reached, or that the resources of preventive medicine have been exhausted. On the contrary, the reverse is true, and while we cannot rationally hope for as rapid a reduction of the death-rate in the future as has been the case in the past, because the limit placed by the natural duration of human life is being more nearly reached with each advance, yet it may be said that almost as much remains to be done as has been accomplished in the immediate past. Notwithstanding the increased strain which is associated with the complexity of modern civilized life, there is no inherent reason why the death-rate, even in such a densely populated city as New York, should not be reduced to 14 or 15 per thousand, or even less, and the average duration of human life increased to fifty years or more.

In speaking of sanitary authorities in relation to the medical profession I desire to refer more especially to the Board of Health of New York City and its relation to those who practise medicine in this city. I would not be understood as speaking for the Health Department, but wish to give my personal impressions as one of its officials.

The attitude of the Board of Health of New York City toward the medical profession has been in many respects more advanced than that of any other sanitary body in the world. The broad position has been taken that it is the function of the Health Department to furnish to physicians all such specific and general information and assistance in relation to the infectious diseases as can be afforded by thoroughly equipped bacteriologic laboratories, in which the work is fully abreast of the most recent observations in scientific medicine. The sanitary authorities of New York

City were the first in the world to assume this position, and while their example has been widely followed in the great cities of this country and Greater Britain, yet nowhere else has this position been frankly taken and consistently followed to the extent that it has been here. It has been the attempt of the Health Board to introduce new measures or to adapt existing measures to the new requirements of every additional observation with regard to any of the infectious diseases which had a practical bearing on prophylaxis or therapeutics. Two considerations, as I interpret the action of the Board, have mainly influenced it in the adoption of this position: (1) The desire to extend as rapidly as possible the knowledge of the most recent discoveries in regard to the infectious diseases and the means for their restriction, prevention, and cure. (2) The desire to afford the general practitioner of medicine, without charge, such expert assistance and special information as may be useful to him in clinical work, and which could not be otherwise obtained, excepting at greatly increased trouble and considerable expense.

It has been the hope of the Board of Health that such a course would materially aid in establishing more cordial and mutually confidential relations between the members of the medical profession of this city and the Health Department, and thus facilitate the work of the Department; and it was thought that the information thus offered would be, in a sense, received in lieu of the money compensation given to private physicians in some countries for reports of births, deaths, and cases of contagious disease. In this country no such compensation is offered; the position assumed being that it is the duty of the physician to make such reports, and that no payment should be received for the discharge of such a duty. Whether this attitude is a proper one or not does not concern us now. My own belief is that the welfare of the community and the rights of the medical profession would

be better conserved by the payment of money for reports of the occurrence of births, deaths, marriages, and cases of contagious disease.

In considering the relations of the sanitary authorities to the medical profession the fact must be kept in mind that the point of view of the Health Department and of the profession are widely separated. The interests of the community, as guarded by the sanitary authorities, and of the individual practitioner of medicine, are apparently divergent, but the real interests of the practitioner, who is at the same time a citizen, are quite in line with those of the community, and it cannot be for one moment assumed that the conscientious, intelligent, and broad-minded physician will view the situation from any point other than that of the community as a whole. Whether the practising physician then arrives at the same conclusion as the Health Board as to the proper course to be pursued by the sanitary authorities will be a question of opinion; there will be harmony of purpose, and, at most, only a difference of opinion as to the methods to be adopted to secure a common object. Considering the apparently diverging interests of the physician and the community, it is not strange that the action of the Health Board and the position adopted by it in relation to some of the infectious diseases should be the subject of criticism by members of the profession.

But physicians apparently often think that radical measures are adopted by the Board of Health after too little consideration and without a full knowledge of all the facts bearing upon the situation—a much fuller knowledge than, from the nature of the conditions, the members of the medical profession can possibly possess. Consequently, the Health Department is severely and often very unjustly criticised for a course which is the only logical one, and one wholly justified when all of the facts are taken into consideration. The medical profession sometimes forgets that the Health Board

legislates and acts for the whole city, not for special sections or for individuals; that many measures which are not demanded or necessary in the best portions of the city are required for the well-being of the inhabitants of the tenement-house districts, and also that special legislation is generally objectionable, must be very carefully restricted, and only resorted to when it has an absolutely special application.

Great discretion has always been exercised in enforcing sanitary measures and the provisions of the Sanitary Code in New York City, and much greater liberty is allowed in private houses than in tenement-houses, because of the lessened danger to the public as a whole. It has never been the policy of the Health Department to interfere in any way in the management of cases of contagious disease occurring in private houses as long as there is no exposure of persons outside of the patient's family. The Department requires that such precautions shall be taken as will protect persons outside from possible infection, but in the family the Department does not interfere. This has always been the policy and the course pursued; but it does not seem to have been fully understood by many of the members of the medical profession.

Physicians occasionally criticise the Health Department for indiscretion or want of judgment on the part of its employees. These criticisms are often justifiable, but unfortunately, they are not, as a rule, made directly to the Health Board, so that the facts may be determined and any wrongs or defects remedied; often they are first made known through the medical journals or through discussions in the medical societies, and thus, only long after the occurrence the Board becomes aware, indirectly, of the cause of the complaint. There are over two hundred physicians in the employ of the Department, all appointed after passing a civil-service examination. Their instructions are always definite, specific, and detailed as regards duties, and all employees of the Department are held to strict accountability for their actions.

Judgment and discretion cannot be furnished to its employees by the Health Board, or by any other body. Every possible precaution is taken to prevent any just cause for complaint, and every one is most carefully investigated, and, so far as is possible, the cause removed and the errors corrected. The Board, however, cannot remedy defects which are not brought to its knowledge. Investigation has also shown in many cases in which complaints have been directly made to the Board that the physicians have been misled by the statements of the patient or family, or by lack of knowledge of all of the facts in the case. The greatest cause for misunderstanding and complaint arises from the fact that only with rare exceptions can physicians be induced to read the circulars of information issued by the Department in regard to its work and the methods pursued. Most of the unsatisfactory results in the work of the bacteriologic laboratories are due to the failure on the part of physicians to follow specifically the directions given. It is impossible where examinations are made from several hundred cases each day, as frequently occurs, to attain anything like a reliable service unless the specific and definite directions given are accurately followed. Still, I think it may be fairly said, that as a whole the work of the Health Department of New York City during recent years has deserved and received the commendation of the large majority of the medical profession of this city.

The duties and responsibilities of the sanitary authorities with relation to the general public are numerous and comprehensive. To a very great extent the general welfare of the community is in their hands. Everything which is detrimental to health or dangerous to life, most broadly interpreted, is properly regarded as coming within their province, and so broad should be the construction of the law that everything which improperly or unnecessarily interferes with the comfort or enjoyment of life, as well as those things which are detrimental to health or dangerous to life, should

become the subject of consideration and action. Sanitary authorities must protect the community from the individual, "the greatest good to the greatest number" furnishing the first rule of action. They must insure the safety of the community as a whole, and, so far as possible, of each person in it, by protection of the community from its component parts, and these again from each other. The interests of the individual and of the community are often divergent, or apparently divergent; for example, in factories and noxious trades, the observation of such sanitary precautions as are necessary for the protection of the health of employees often involves serious expenditures which fall upon the owners. Again, the welfare of the individual frequently requires such changes in the physical condition of property—tenement-houses for example—as the tenants would not themselves demand. In cases of contagious disease it may sometimes be to the interest of the individual to be left in his own home, while the good of the community urgently requires his removal to an isolation hospital. It becomes at once evident, in all such instances and many similar ones, that it is the plain duty of the sanitary authorities to exercise judiciously, but firmly, the autocratic powers given to them by law. They should not interfere in regulating individual action, at least only to a very limited degree, unless such action involves danger or detriment to the community.

A glance at the functions performed by sanitary authorities shows how broad is their scope: Primarily, sanitary science aims to insure to a community and to each individual an abundant and pure supply of air, light, water, and wholesome food. In the great aggregations of population found in our large cities the preservation of the purity of the air and insurance of an abundance of light and good ventilation involves most comprehensive measures relating to the character of the habitations—their cleanliness and the cleanliness of their

surroundings, including the streets; the provision of efficient plumbing; good sewerage; sufficient air-space to the individual, that is, the prevention of overcrowding; protection against noxious vapors or odors arising from offensive trades, slaughter-houses, gas-houses, decomposing animal and vegetable matter, and the purity of the atmosphere, so far as suspended solid particles are concerned.

These functions of the sanitary authorities are performed through official inspections made by inspectors of plumbing, ventilation, overcrowding, nuisances, noxious trades, and by the general sanitary inspectors. An abundant and pure water supply is one of the first and most essential factors in insuring healthfulness in a large community. Without this, cleanliness, in a broad sense, is impossible, and cleanliness is the first consideration in all sanitary work. Further, the purity of the water supply is a most important factor in the prevention of many forms of water-borne disease. New York City is particularly fortunate in this respect; no great city of the world has a more abundant or purer water supply. In this connection we must not confuse what is unpalatable to the taste or appearance with actual purity. At certain seasons of the year the Croton water is unattractive in appearance and has a disagreeable odor and taste, due to suspended vegetable matter. There is no evidence, however, to show that this is really detrimental to health.

It is also incumbent upon the sanitary authorities to prevent adulteration and to guarantee the wholesome quality of food. This is attained through specially trained inspectors of meat, milk, fish, fruit, and general foods. The purity and quality of various drinks must be inquired into, and the relative food values of different articles of diet determined. Not only must an abundant supply of light, pure air, and water be insured in the homes of the individuals of the community, but the same must be found where they are engaged in their

daily occupation, in factories, mercantile establishments, etc.; all the sanitary conditions surrounding these must be supervised.

The general sanitary inspections include inspections relating to street excavations, wells, privies, stables, the conditions surrounding the removal of garbage and dead animals; conditions in public places and places of assembly; the manner and place of burial, etc.

A special feature of the work relates to the restriction and prevention of infectious diseases. Personal and general cleanliness is to be regarded as a most important and almost universally valuable safeguard against all forms of infection, yet the most ingeniously devised systems of plumbing, drainage, and street-cleaning cannot avail to protect the individual from direct contagion. The greatest value of the system of notification of the existence of contagious disease is due to the fact that it enables the authorities to adopt intelligent and scientific measures to prevent the direct transmission of contagion. Their energies are not then wasted in ill-conceived and inefficient measures. It should be clearly understood that the reporting of the occurrence of infectious diseases is most useful only when the direct causes of the diseases reported and methods of their transmission are accurately known and amenable to control. The public, and even the medical profession, have not yet fully learned the lesson, though it seems almost axiomatic, that different diseases require to be controlled by different methods, and the more accurate and extensive our knowledge of the nature and causes of the different infectious diseases the more unlike become the intelligent measures devised for their prevention.

The conditions of the general sanitary administration in this country now much resembles that existing in Great Britain twenty-five years ago, previous to the enactment of the Public Health Act of 1872. There is everywhere lacking the presence of intelligent, thoroughly trained sanitary

officers, because there are no provisions in this country for the education of men in matters of public health. The knowledge required for the intelligent discharge of the duties of medical officers of health is broad, comprehensive, and entirely unlike that required for a medical adviser. There is, so far as I am aware, no place in this country where the complete training required can be obtained. Consequently, outside of the large cities the medical officers are generally physicians without special knowledge, experience, or ability in the performance of the work required. Unfortunately, too, the compensation is insufficient and the tenure of office insecure, frequently depending upon local political influences. It, therefore, becomes almost impossible that such officers should act in the prompt, firm, and fearless manner often required, and especially is this true when the interests of persons prominent in the community are jeopardized by their action. The community, in other words, must suffer because the interests of its prominent members are different from those of the people at large. In regard to even the larger towns and cities all this may be said with almost equal force.

There are no men to be found anywhere in this country with a broad knowledge of public medicine. In the great cities there are officers in the service of the health departments who, from practical experience and long training, have acquired the special knowledge requisite for the efficient discharge of duties in a narrow sphere of work. But even in the large cities none are to be found whose knowledge covers the whole sphere of public medicine. The great sanitary need of the time is for the establishment of training-schools in public health (similar to those existing in Great Britain), the education of physicians in the special knowledge required, and the enactment in the various States of laws requiring that medical officers of health should have diplomas in public health, such diplomas representing the requisite sanitary knowledge; and those not possessing such creden-

tials should not be eligible for public health appointments. The compensation for sanitary work should be larger, the tenure of office more secure, and the appointments made by State or national authorities, rather than dependent upon local influences.

As the country grows older and more densely populated, the cities larger and more crowded, the demand for intelligence in the administration of sanitary affairs will become more urgent. In addition to the improvement in local conditions, there should be added a national supervision exercised through a properly constituted National Bureau or Department of Health. With the fulfilment of these two requirements in the future, we may hope finally to attain more nearly ideal sanitary conditions throughout the whole land.

MEMORIAL OF THE LATE J. LEWIS SMITH, M.D.

BY ELLSWORTH ELIOT, M.D.

Job Lewis Smith, A.B., M.D. Born in Spafford, Onondaga County, N. Y., October 15, 1827. Died in New York, N. Y., June 9, 1897. Buried in Greenwood Cemetery, Brooklyn, N. Y.

Mr. President, Fellows of the New York Academy of Medicine:

There are Fellows of the Academy whose closer relations with Dr. Smith's professional career and whose knowledge of the subjects in the investigation of which he was largely occupied, would make them better qualified to tell the story of his life, and do more exact justice to his attainments than the one to whom this duty has been assigned. But your speaker has the advantage of an acquaintance beginning at an earlier date than that of any of our fraternity in this city, with the exception of our associate, his brother.

More than fifty-one years ago I saw him for the first time, as he entered the recitation-room of the third division of the class of 1849, in Yale College, in the last term of Freshman year. We had started on our collegiate course the previous fall, and he had the disadvantage of joining our ranks while on the march instead of at the outset. Not brilliant in appearance, it was evident that he had not been thoroughly prepared for the college course, but he acted like a resolute, plodding, persevering young man who had made up his mind that he must have an education. As some rural legislators at our State capital are in our day spoken of as belonging to the hay-seed order, the presumption was that the new

Freshman belonged to that class. Many of us were farmers' sons from the back-woods. Soon we discovered that Smith was making for a place among the foremost, which he promptly obtained and retained. Early in his college life he took the first prize for the solution of mathematical problems. One hundred and sixty-two were connected with our class, of which number ninety-four received the Bachelors' Degree in August, 1849, Smith's scholarship giving him rank in the first twenty-five. While in college his aim seemed to be to follow strictly the prescribed course, without having in view any special preparation for a calling subsequent to graduation. He was not one of those students who have great celebrity in college life, and, this finished, gradually dwindle into obscurity. Those secret societies, known to outsiders by some letters of the Greek alphabet, or by some mysterious words, among the members of which are enrolled the wealthy, the brilliant and popular fellows, ready with the tongue and pen, did not rush after him for initiation into their mysterious band, and bedeck him with a breast-pin, or a watch-key, marked with mysterious letters and emblems, the significance of which was known only to themselves. His rank in forthcoming years was of more importance, and this he creditably achieved. Few of his classmates, among whom may be mentioned the Rev. Timothy Dwight, now President of old Yale, and the Hon. Francis Niles Finch, one of the Judges of the Court of Appeals in this State, have done as much credit to their alma mater.

Yale College of our day was different from Yale University, as it is now called. Then we did not have intercollegiate foot-ball games and boat-races, attracting crowds numbered by thousands. The "largest and most complete gymnasium," which a distinguished Englishman, when travelling in this country, had ever seen, did not then exist. Then the chapel-bell roused us at six o'clock

in the morning in winter, and at five o'clock in summer. Frequently, through the pelting rain, or the driven snow, we made our way over sloppy sidewalks to the chapel, as in fifteen minutes from the first ringing of the bell, when the President was in the pulpit to read the Bible and make the customary prayer, we must be in our seats for a service of fifteen minutes. The morning recitation of an hour followed, and we could then have our breakfast. Daily we were called to morning and evening prayers, and on Sundays we were required to be present at four religious services. Now a Yale academic student goes to chapel in the morning after his breakfast, and subsequently to recitation. On Sundays the compulsory religious obligations are discharged by a single attendance at the chapel at the customary morning hour. Then the annual tuition fee was $33. Table board was obtained from $1.25 to $3 per week. To the majority of Yale students this item was less than $2 weekly. The aggregate annual expense was from $140 to $210. Now the minimum annual expense at Yale is stated at $350 for the lowest, $545 as a general average, and $830 as very liberal.

The laws of the college required us to "show in speech and behavior all proper tokens of reverence and obedience" to the faculty of the college, and if we were guilty of any kind of contempt of their persons or authority, we were liable to punishment by censure, or even by expulsion. Again, "No student shall keep a horse or carriage for use in the town of New Haven; nor shall any student hire a horse and carriage in New Haven in term time without permission from some one of the faculty." Again, "If any student shall play at billiards, cards, or dice, or any other unlawful game, or at backgammon, or at any game for a wager, or shall keep in his chamber cards or a backgammon-board, or shall call for any strong drink in any tavern or other place within two miles of the

college, he shall be punished for the first offence by admonition, and for any subsequent offence may be suspended or sent home." Whether these and such like laws are now in the Yale statute-book your speaker is unable to say, but it is safe to assume that, if existing, they are not rigidly enforced. In fact, abundant evidence could be furnished that violations thereof were generally passed unnoticed by the faculty of fifty years ago.

But Yale College now is as different from the Yale of our day as are the magnificent buildings, recently erected, from the old brick rickety row, a few specimens of which are still to be seen. But college life then had its charms, which the garrulous graduates never tire of recalling, doubtless sometimes exhausting the patience of their hearers.

We left old Yale with most friendly feelings, each classmate for all its members, such as come from the close relations of four years' very intimate association. Smith, I do not believe, had an enemy in college. Not having decided then what to do, he congratulated your speaker because he had made choice of the medical profession, and was, in his opinion, qualified for its demands, and for examination in various ways, especially, he humorously remarked, upon the sartories.

Leaving Yale he was at sea, undecided in regard to his future. He always considered well his steps, was seldom in a hurry, and always slow and cautious in announcing his conclusions. For several months he thought seriously of studying theology and becoming a minister. At length he finally decided to study medicine, and he began with unflagging industry, not discontinued till death called him away. Such persevering diligence had distinguished his family for generations, and the discipline of his early years had made it habitual. His earliest known ancestor was John Smith, one of the first settlers in Milford, Conn.,

his record beginning in 1643. His grandfather, Job Smith, was an officer in the Revolutionary War, Fifth Regiment, Connecticut line. He carried the family name to Stafford, in Onondaga County, this State. His father, the Hon. Lewis Smith, was a prominent citizen of that county, depending mainly for the support of his family upon the products of his farm. An abundance of the comforts of life was probably unknown. The boys, when old enough, shared in the toils of cultivating the land, looking after the cattle, gathering in the harvests, and doing the chores.

New England farmers and their descendants, wherever found, must have schools for their children, and of one of these the boy Smith had the advantage in the winter and during other seasons when the labors upon the farm would permit. While preparing for college he studied at Cortland Academy, Homer, N. Y. An occurrence, interesting professionally and otherwise, interrupted his juvenile pursuits at the age of seven years. A large, painful tumor in the abdomen, low down on the right side, was agonizing. The old country doctor said it was a gathering which might break inwardly and cause his death. Fortunately, its contents were discharged into the bowels, but the poor boy was apparently at death's door before relief came. Dr. Smith in later life regarded his case as one of appendicitis.

The name of his mother was Chloe Benson, a descendant of a Massachusetts Puritan emigrant.

Having decided to study medicine, he placed himself under the instruction of Dr. Caleb Green, and later under Dr. Frederick Hyde. The late Professors Austin Flint and Frank H. Hamilton, of Buffalo, N. Y., when he attended in that place his first course of lectures, were his preceptors; and, during his residence in that city, he spent a year in the Buffalo Hospital of the Sisters of Charity.

His second course of lectures was at the College of Physicians and Surgeons, in this city, which institution conferred upon him the degree of Doctor of Medicine in 1853. Immediately he began to practise his profession at No. 137 West Forty-ninth Street, then on the outskirts of the city; and, though having a special liking for studying and treating the diseases of children, he became and continued a general practitioner. Thus he wrote, "Any specialist, in my opinion, is a better specialist for being a good general practitioner." Specialties as we have them were then unknown. That of diseases of children was mentioned incidentally in connection with other subjects. The medical schools had a professorship of obstetrics, diseases of women and children, a single department, which is now divided into three, each having one or more professors. Something had been done in this city in the way of managing sick children. Dr. Samuel Bard had, in 1771, published his observations in regard to sore throat, describing diphtheria with wonderful accuracy as it has prevailed since about 1860. Dr. James Stewart had published a praiseworthy book on diseases of children in 1843. Drs. Beck and Watson had published valuable articles on diseases of children. But this field was comparatively unwrought when Dr. Smith appeared. And what a revolution he witnessed, of which it may be justly claimed he acted a leading part. A death from diphtheria was not reported in this city until February 15, 1852, just before Dr. Smith began his work. As late as 1858 there were but five deaths reported in that year from this disease. He lived to see thousands die and more recover. In regard to the foundlings in this city he writes: "Several years ago, before the New York Foundling Asylum was organized, the foundlings were assigned to the care of pauper women in the Almshouse on Blackwell's Island. The steam-boat every morning brought them to the island,

and every afternoon carried an equal number for burial in Potter's Field. To me was assigned the unpleasant duty of visiting and prescribing for them, and a single infant was pointed out to me which had not died in the usual time. In the New York Foundling Asylum, incorporated in 1869, and in the New York Infant Asylum, chartered in 1865, in both of these institutions, as at first managed, as in the Almshouse, the deaths equalled the admissions. It is unnecessary to relate here the methods adopted for saving infantile life."

Dr. Smith's first office was in a locality abounding in poor and neglected children. Of the territory between Fiftieth and Eighty-sixth Streets, on the west side, then not famous for its well-paved streets and avenues, palatial residences, and beautiful churches, as now, he has left a graphic description. Shanties then were the prevailing feature. There were some wooden and brick tenements, and a few good houses were scattered here and there. But in 1864 the shanties numbered five hundred. Many of these, hard by old but obstructed water-courses, amid collections of stagnant water, which were generally the receptacles of dead animal and vegetable matter, were occupied mostly by Irish and German families, who kept cows, pigs, and poultry, upon which they, in some instances, solely depended for their living. His description of a shanty, and of shanty-life, reveals a remarkable difference between the people then residing there and the present inhabitants, the latter, perhaps, being in some cases the posterity of the former. His description of a shanty is interesting: "The typical shanty is built of rough boards, which form the floor, the sides, and the roof. It is built either on the ground or but little raised above it. It is from six to twenty feet high, and its ground area varies much in different cases, but it is always of moderate extent. It contains no fire-place or chimney, but a stove, the pipe from

which passes through a hole in the roof. It has from one to three or four windows, with single sash, each containing from four to six panes of small size. Some shanties have but one room; others, an additional small apartment used as a bedroom. The better shanties are lathed and plastered. It is evident that to the occupants of the shanty domiciliary and personal cleanliness is almost impossible. In one small room are found the family, chairs usually dirty and broken, cooking utensils, stove, often a bed, a dog or cat, and sometimes more or less poultry. On the outside by the door in many cases are pigs and goats and additional poultry. There is no sink or drainage, and the slops are thrown upon the ground. The water used is sometimes the Croton, which is brought to the shanties in pails, usually from one of the avenues. In other places, where the Croton hydrants are too far away, and the ground is marshy, the water is obtained from holes dug a little below the surface. This water has a roiled appearance and an unpleasant flavor. Shanties are usually built promiscuously over the ground, without the least regard to order. Families living in them are largely squatters, and such people, of course, select for residences localities for which no profitable use can be made by the proprietors. Therefore, shanties in this district are built on rocky, elevated ground, or on lots sunken and too wet for tillage." The practice of medicine in such neighborhoods is not a delightful lot, as some of the elder ones among us well remember, and as some of our younger associates may be learning. In connection with midwifery in this locality, Dr. Smith writes: "An amount of self-denial is required on the part of the physician in some of these cases, if he treat his patients carefully and judiciously, which few can appreciate who have not been similarly situated. To stay hour after hour, perhaps all night, in a shanty or close room of a tenement-

house inspiring an atmosphere which is poisonous, afraid to lie, or almost to sit, through regard for personal cleanliness, obliged to answer perpetual queries in reference to the patient, and that, too, when there are urgent and more remunerative cases elsewhere, or when sleep is greatly needed, requires an amount of patience and benevolence which everyone does not possess."

And yet, I ween, professional life in these quarters and in the children's hospitals which he professionally attended, had often greater attractions for him than the abodes of the wealthy, to which he was frequently summoned in later years, as family physician or consultant. In the former his investigations were not impeded by the conventionalities associated with wealth and refinement. A knock at the door of this shanty or the tenement-houses brought him immediately to the bedside of the sick, where, without the preliminaries of fashionable life, he could pursue his investigations in the most informal and speedy manner, and, having given all necessary directions in the kindest manner, he was soon elsewhere, thus probably seeing more patients and doing a larger practice than any other physician in that section of the city. Among these people he laid broad and valuable foundations, and they in return were most tenderly appreciative of his unlimited acts of kindness to them. He attended the same families and three generations, such was their attachment to him. Those of us who lived in the trying times of the Rebellion can never forget the memorable days in 1863, when what is historically known as the Draft Riot was at its height in our streets, when it was unsafe for respectable people to be abroad. Dr. Smith was in his carriage visiting his patients. Suddenly a crowd of rioters seized his horse, and the doctor might have had a rough, perhaps a dangerous handling, had not an old Irishwoman rapidly made her way to the most violent and yelled:

"That is Dr. Smith, let him go!" The crowd immediately sank back, and he went on his way rejoicing.

His interest in the diseases of children led him to accept the appointment of Curator in the Nursery and Child's Hospital, on Lexington Avenue, in 1859. Soon he had other positions in dispensaries, asylums, hospitals, and colleges, having received appointments therein on account of his general professional knowledge, particularly of diseases of children, and his skill in their treatment.

Dr. Smith, being so prominent an authority in diseases of children, was several times placed foremost among those who meet for their study. At one time he was Chairman of the Section of Diseases of Children in our Academy. He was one of the founders and the second President of the American Pediatric Society. At the meeting of the Ninth International Congress, held at Washington, in 1887, he was selected as President of the Section of Diseases of Children, a position which he filled with great success and credit. These places of honor were not of his seeking, but they came to him as falling bodies follow the law of gravitation.

He had not been long from his medical alma mater before a contribution from his pen appeared in one of our medical journals. The extraordinary number of one hundred and sixty followed. In a few years his reputation had become so extensive that a Philadelphia firm made proposals to him for a treatise on diseases of children. He at first promptly declined the tempting offer, thinking that he was unequal to the work. Fortunately, the advice of his friends induced him to change his mind, and the first edition appeared in 1869. Large editions followed, the eighth being the last. With scarcely an exception, medical schools throughout the United States adopted it as a text-book. It was translated into Spanish, and permission had been asked for a translation into Ger-

man and other languages. Said one of his associates to the writer: "His book has been found on the shelves of more physicians in the United States than that of any other New York medical author." At the last meeting of the American Pediatric Society the President, Dr. Samuel S. Adams, said: "It is a work on diseases of children that has immortalized his name, and his heart must throb with pride upon realizing that he has been able after twenty-seven years of active professional life to issue the eighth edition." "This greatly overrates me," said Dr. Smith, the day preceding his unexpected death. The fact is, "he had builded better than he knew." In a memorial sketch which he read on the occasion of his old preceptor, Dr. Flint, is found: "No one can read Flint's treatise without recognizing in it an enduring basis, so that with the additions made to it from time to time of discoveries as they occur in medicine, it will probably continue to be one of the text-books consulted for information and guidance long after the present generation have passed away." The same may be truly said of Dr. Smith's work. Hereafter whoever shall desire information in regard to diseases and their treatment in this city, as they prevailed in the latter part of the nineteenth century, will find accurate statements in the works of Austin Flint and of his pupil, J. Lewis Smith.

The long professional life of forty-four years was not cloudless. His wife, Mary Ann (Hannah), died January 27, 1878. Of the three sons and four daughters born to them, one, who bore his father's name, died early in his career as a promising physician. A son-in-law, Frederick W. Warner, M.D., to whom he tenderly dedicated the last edition, died at an early age. Three of these children were alive at the time of their father's death, and those familiar with that family circle testify to the contentment and happiness that therein prevailed.

As the end of his very laborious life was approaching, his condition and its close are thus described by his brother: "He had not had good health for several years and was at times quite incapacitated for the fatiguing duties of a general practitioner. His health was still further impaired a few months since in a runaway accident, in which he received a considerable nervous shock. He had scarcely recovered from its effects when he was thrown from a cable-car, and so much lameness was the result that he was confined to his room. His digestion now became very much disturbed, followed by loss of strength and enlargement of the heart. The end came quite suddenly on the morning of the 9th inst. (June), after a comfortable sleep, in a paroxysm of dyspnœa with cardiac syncope."

The evening before his death he looked over some manuscript, to make it more suitable for publication (it proved to be posthumous), obeying unconsciously the biblical command: "Be thou faithful unto death." The brief and timely remarks of the clergyman, who, at his funeral, spoke of his religious life, gave assurance that the promised reward was Dr. Smith's inheritance. As he had not quite reached the Psalmist's limit of life, his friends might hope that he would continue to add sheaves to the abundant harvest he had already gathered, and enjoy their fruits. Pleasant would it have been to have seen him coming forward in our societies in his modest, hesitating manner, with his roll of manuscript, and profitable would have been the presentation of his latest observations and researches. But he was to be no more. In the words of the poet, some comfort for the members of his afflicted family and for us may be found:

> " But perhaps it still is better that his busy life is done:
> He has seen old views and patients disappearing one by one;
> He has learned that Death is master both of Science and of Art:
> He has done his duty fairly, and has acted out his part."

MODERN VIEWS ON CERTAIN SYMPTOMS AND CAUSES OF RENAL DISEASE.

THE WESLEY M. CARPENTER LECTURE, 1898.

BY C. A. HERTER, M.D.

More than seventy years have passed since Richard Bright sought to demonstrate to an incredulous profession that an intimate relation exists between dropsy and the presence of albumin in the urine on the one hand, and certain pathologic alterations in the kidney on the other. During this period, investigators all over the world have convinced themselves of the accuracy of Bright's teachings with regard to this relation. For many years those who followed in the path of the distinguished physician did little more than to amplify his descriptions of renal disease. But it would have been singular, indeed, had renal pathology received no illumination from the newly directed and intense activities of the past twenty years in the domain of scientific medicine. The study of bacteriology and of pathologic chemistry, the growth of experimental pathology, and the greater accuracy of clinicians in recording their observations, have all contributed to increase materially the sum of our knowledge of the symptoms and causes of renal disease.

It is my purpose this evening to touch on some of the more modern and important problems of renal pathology—a domain which affords such an abundance of material for the modern commentator that there is some danger of an *embarras de richesse.*

The presence of albumin in the urine was, for many years, looked upon as pointing almost unmistakably to the presence

of Bright's disease of the kidneys, and it cannot be doubted that the generation of physicians who lived in the middle of this century was in general inclined to attach too serious a prognosis to the mere presence of this symptom. In the past ten years there has been a wave of reaction, which, like most reactionary movements, has overstepped the bounds of moderation. To-day we find a voluminous literature, indicating that the presence of albumin in small amount occurs not only in a variety of trivial affections, in which there is no reason to think that the kidney is the seat of lesions, but also in a considerable proportion of apparently healthy people. Indeed, there is a small but influential school of clinicians, of which Senator is the central figure, which contends that the urine in health is always a weakly albuminous fluid.

Can we safely accept these views, which lead inevitably to the important practical conclusion that slight grades of albuminuria may have no pathologic meaning—are in fact "physiologic?" I think there are serious obstacles to adopting them. In many instances the methods used by the supporters of the doctrine of physiologic albuminuria have not been beyond criticism. It is claimed that some of these methods enable us to recognize albumin when vulgar tests, like that by heat or by cold nitric acid, fail to detect it. This is probably true of Millard's test and some others. The difficulty with these refined tests is that some of them react with substances which certainly are not ordinary albumin, *i.e.*, the serum-albumin and serum-globulin of the blood. Thus both mucin and nucleoalbumin, a phosphorus-containing body derived from the nuclei of cells, such as the epithelial cells of the urinary tract, are readily confounded with true albumin.

It is not possible to enter here upon a discussion of the reactions of nucleoalbumin. What I wish to emphasize is that when we employ certain delicate tests for albumin we run the serious danger of calling substances albumin that

have an entirely different origin and significance. Even the cold nitric and potassium ferrocyanide tests are not entirely free from this objection, but used in conjunction with the heat-test they seem to me the most practicable means for the recognition of albumin. I believe that when we are unable to find albumin in the urine by the use of the heat-test, the cold nitric acid test, and the potassium ferrocyanide test, but do find it by means of other reagents, we can safely assure our patient that he has no albuminuria. Probably it is not strictly true to say that such a urine never contains albumin, but I am convinced that albuminurias that cannot be recognized by the three tests mentioned are only important as material for erroneous practical conclusions and have no interest for the practitioner.

It is probable that most of the "physiologic" albuminurias have been of this apocryphal character. Leaving aside these cases, there is an important group of patients in whom small quantities of true albumin appear in the urine regularly, or frequently, but whose health continues unimpaired. Some of these patients give a history of scarlet fever or of some other severe infectious disease, which many years before was complicated by nephritis, and we frequently can only regard these slight albuminurias as expressions of residual nephritic states, even where the specific gravity of the urine remains normal and we are unable to find casts. In other instances there is no history of nephritis. How are we to look on these albuminurias? Are they due to trivial nutritional alterations in the glomerular capillaries which do not entail histologic changes, or to the finer histologic alterations of actual nephritis? *

We are not yet in a position to decide this question. It is clear that a kidney which permits the escape of albumin is

* Some writers refer a portion of these albuminurias to an altered blood-state. I believe there is no satisfactory evidence that a pathologic blood-state ever causes albuminuria without first inducing changes in the structure of the kidney.

different from the majority of normal kidneys. It is possible that it will one day be shown that there are "functional" albuminurias, but I strongly incline to the view that slight glomerular or epithelial lesions are present in all instances of true albuminuria. Practically, however, it is no very important matter whether we have to do with nutritional alterations or with slight structural changes. The important fact is that such patients as we are considering usually live many years without showing indications of serious renal disease. But it is certainly a mistake to say that the kidneys of these persons are normal. I think that the view of the older generation of physicians, that albuminous urine from the kidney points to nephritis, is nearer the truth than that albuminuria is often physiologic. The mistake of the older school is in the failure to recognize that patients frequently live in good health for ten or twenty years with slight nephritis.

The recurrence of albuminuria at particular times of the day, that is, its cyclical character, is sometimes regarded as a sign that the affection is functional. This is an erroneous inference. I have records of numerous cases of unquestionable nephritis in which the albuminuria was cyclical.

Several important practical facts relating to albuminuria have forced themselves on the minds of physicians within recent years. One is that there is no satisfactory evidence that the degree of albuminuria is controllable by medication. Another is that the nitrogenous or non-nitrogenous character of the food appears to exert little or no influence on the quantity of albumin. This is not equivalent to saying that the character of the food as regards its content of nitrogen, is of no importance in the treatment of Bright's disease; the statement refers merely to the direct influence of food upon the quantity of albumin that escapes from the kidney. Many patients have been harmed by having their proteid food cut down in the hope of influencing albuminuria. When the loss of albumin is large, amounting to eight or ten grains

daily, an unusually rich nitrogenous diet is required to protect the organism from the loss of its nitrogen. Another fact of practical import is that in cases of slight albuminuria the posture of the body very frequently exerts a distinct influence upon the amount of albumin in the urine. Numerous observations have convinced me that the erect posture often favors the escape of albumin, while the horizontal posture hinders it. The bearing of this fact upon the treatment of chronic nephritis is obvious. One other point concerning the temporary absence of albuminuria in chronic nephritis deserves mention. Not only do we meet patients with nephritis whose urine is free from albumin at certain times in the day; there are instances in which the urine fails during several days to give a definite response to the test for albumin. Although this has come to be well known to physicians in recent years, its relation to the diagnosis of renal disease is so important that it seems worthy of special emphasis.

Modern investigations have shed light on another symptom of renal disease, which, if not so regular an accompaniment of nephritis as albuminuria, is still an object of much interest both to practitioners and pathologists. This symptom is dropsy, the dropsy that distinguishes renal disease in the absence of cardiac lesions competent to account for the symptom. It was the view of Bright that renal dropsy is due to the hydræmia which follows the protracted loss of albumin in nephritis. Grainger Stewart and Bartels saw that this cannot be regarded as a satisfactory explanation of most cases of renal dropsy, because dropsy often occurs in acute disease of the kidney before there has been much loss of albumin, and, on the other hand, fails to develop in some patients who have long been the subjects of pronounced losses of albumin. Bartels, watching his cases closely during considerable periods of time, came to the conclusion that there is a rough correspondence between the ability of a nephritic patient to excrete water and his freedom from

dropsy. Failure to excrete enough water was followed by dropsy. Re-establishment of the flow of urine was apt to be followed by disappearance or diminution of the œdema. The accumulation of water in the organism, producing the so-called "hydræmic plethora," was thus thought to be an essential factor in the causation of dropsy, and this view is still held by many physicians. The impartial student of renal disease is forced to admit that there are important clinical facts which cannot be reconciled with the doctrine of the hydræmic origin of dropsy. Thus it is necessary to account for the entire absence of dropsy in some cases of acute nephritis with suppression lasting for several days. Perhaps the most convincing proof that the "hydræmic plethora" doctrine is inadequate, is to be found in those cases of prolonged anuria from impaction of calculi in the ureter. Patients observed since the days of Bartels have gone more than a week without passing urine and without becoming dropsical. Yet we cannot imagine a condition more favorable to the production of hydræmic plethora. Then, again, one sometimes meets with renal dropsy in which there is no evidence that the blood is hydræmic. I have in several instances found the specific gravity of the blood-serum to be normal in persons with nephritic œdema.

Is there any hypothesis which, by explaining the clinical facts relating to renal dropsy, is fitted to displace those just mentioned? I believe that the view which attributes renal dropsy to alterations in the walls of the smallest blood-vessels is the one which we shall ultimately accept. Cohnheim was the first to advance this hypothesis, basing the idea mainly on theoretic grounds. Recent studies in the pathologic histology of the kidney give important support to the contention that renal dropsy is closely connected with vascular lesions. The facts which stand out most significantly are, first, that a very large proportion of cases of acute and subacute renal dropsy are associated with well-defined glomerular lesions in

the kidney; and, secondly, that very many though by no means all cases of acute and subacute glomerular nephritis are associated with dropsy. By glomerular nephritis is meant a condition of the kidney in which certain lesions of the vascular tufts are prominent or preponderating. These lesions are chiefly of two kinds, which may exist separately, but are often combined. One variety (intracapillary glomerulitis—Welch) is distinguished chiefly by proliferation of the endothelial cells of the vascular tufts. This is the more common form. The other variety is characterized mainly by proliferation of the capsular epithelium and accumulation of cells in the capsular spaces (desquamative glomerulitis).

These glomerular alterations are probably dependent on the action of toxic substances or pathogenic organisms which reach the kidney by the blood-stream. That this is the case may safely be inferred from the conditions under which acute and subacute glomerulonephritis are generally encountered. It is in pathologic states such as scarlet fever, malignant endocarditis, erysipelas, acute articular rheumatism, and severe malaria that glomerulonephritis is most often encountered, that is, states unquestionably of infectious origin. Thus in the occurrence of glomerular lesions we have an indication of a pathologic blood-state capable of damaging vascular structures. It would be singular if this damage were limited to the vascular apparatus of the kidney. We do not possess anatomic proof that there is damage to the vessels of the skin in cases in which there is renal dropsy and glomerulitis, but structural alterations must be considered very probable. According to this hypothesis certain poisons in the blood are capable of producing both glomerular lesions and changes in the vessels of the skin which permit the transudation of serous fluid. That the alterations in question are capable of leading to the transudation of serous fluid is shown in the case of the renal tufts by the presence of albumin in the urine. This albumin, which is usually

abundant, can be shown by appropriate methods of studying the kidney to come at least in part from the glomeruli. How are we to account for the circumstance that some cases of glomerulonephritis are not accompanied with œdema? We must recall in this connection that the tufts of the kidney possess physiologic peculiarities which render their vascular loops especially vulnerable. The high pressure under which the blood passes into these loops and the slow progress of the blood through them serve to bring the blood into intimate contact with the capillaries. This affords a favorable opportunity for the injurious action of toxic substances in the blood. The same toxic agents, acting upon vessels like those of the skin, might require a larger period of time to injure them sufficiently to permit transudation, or might fail altogether to lead to transudation unless present in greater concentration.

While the vascular hypothesis of dropsy is by far the most satisfactory one for the œdemas of acute and subacute nephritis, it does not seem so generally applicable in its simple form to the dropsies of chronic nephritis. In such cases there are often other elements to be considered. Thus an increase in the water of the blood, such as occurs in many patients with chronic nephritis and which by itself would not cause transudation, may perhaps suffice to bring on a leakage of serous fluid from vessels already damaged, but not enough altered to permit an abnormal escape of serous fluid from the blood of normal specific gravity.

In chronic nephritis, again, the altered nutrition, not merely of the vessel-walls but also of the connective tissues about the vessels, may perhaps favor the production of œdema. Another element which certainly plays a part in bringing on the dropsy in many instances of nephritis is the high venous pressure and low arterial pressure which is present when there is considerable cardiac weakness. It is often impossible to estimate the influence of cardiac weak-

ness, especially when the deranged circulation is myocardial and not valvular in origin.

I have collected the autopsy-records of a large number of patients who died with renal lesions, and have analyzed them with a view to seeing in what kind of kidneys the so-called renal œdema is most frequent. Roughly classifying the kidneys according to size, it was found that dropsy was almost twice as frequent among the patients with kidneys of large size (weighing about 6 oz.) than among the patients with contracted kidneys (weighing less than 4 oz. each). The number of cases of renal dropsy was also much greater in patients with large kidneys than in those with medium-sized kidneys (weighing between 4 and 6 oz. each). This greater frequency of renal œdema among patients with large kidneys seems closely connected with the fact that acute and subacute glomerular lesions are much more common among the large kidneys than among the other classes.

If we accept the view that œdema and the lesions of glomerulitis are very frequently dependent on the same cause, namely, a toxic blood-state, we feel the necessity for caution in using the expression renal œdema in the sense that œdema is caused by nephritis. We cannot safely assume that œdema is the result of nephritis until it is clear that the failure of the kidney to do its duty in excreting water or toxic materials is actually competent to induce serous transudations from the vessels of the skin and subcutaneous tissues.

We may pass now to the consideration of two symptoms, or rather accompaniments, of renal disease, which possess a considerable degree of practical interest, though they have as yet received little study. These are delayed excretion and bacteriuria.

Delayed renal excretion may be defined as the postponement of the work of the kidney in ridding the blood of its excretory solids owing to renal disease. The postponed work consists either of the normal work of the kidney in excreting

urea, salts, etc., or of unusual excretory work imposed on the kidneys in the course of disease, or for the purpose of testing its activity. The substance most often employed in making this test is methylene blue.

Delayed excretion of urea occurs in a variety of pathologic states of the kidney, in acute and chronic nephritis, renal tuberculosis, amyloid kidney, etc. The delay is expressed in the fact that the urea formed in a given time within the body and normally excreted in a given period requires a longer time for its removal than in health. Thus kidneys which have for a considerable period averaged a daily excretion of 30 gm. of urea may suddenly take two days to do this task, while the demand on them continues as before. In such a case there would be a well-defined delay in the excretion of nitrogen. In acute diseases of the kidney the delay may be much greater than in the instance above supposed. Under such conditions the work of one day may be prolonged over three, four, five, or six days. Similar delays frequently arise in the course of chronic nephritis. During such a delay the urea of the blood is increased. If the delay is short, the accumulation of urea in the blood is trivial; but if the delay extends over a long period, the increase in nitrogen of the blood may become distinctly pathologic. When the percentage of urea rises to about 0.3 per cent. in the blood, that is, to about ten times the normal content, the patient has either developed unmistakable symptoms of uræmia, or is in imminent danger of doing so. I have elsewhere insisted on the practical value of knowing the percentage of urea in the blood of nephritic subjects. This knowledge, which can be readily obtained from an ounce of blood, is probably of more definite significance for the outlook of a patient with chronic nephritis than any information as to delayed excretion. Very often, however, there is hesitation about bleeding, and

then a knowledge of whether there is delayed or normally rapid excretion may be very desirable.

In practice it is not feasible to study the excretion of urea with a view to discovering whether it is delayed. This is owing to technical difficulties which need only be referred to here. In place of a study of the nitrogenous excretion, the kidney may be interrogated by means of the methylene-blue or potassium-iodid test. When methylene-blue is introduced into the body of a normal person by injection into a muscle (*e.g.*, the vastus internus), it appears in the urine after a few minutes (ten to thirty). If the dose be moderate, say, one grain in ten minims of water, the dye continues to color the urine for a period lasting from fifteen to forty-eight hours in different persons. In most normal individuals the coloration disappears in the course of thirty-six hours.*

When methylene-blue (in the dose mentioned) is injected into the muscle of a patient suffering from nephritis the color appears in the urine, usually as promptly as in health, sometimes after a delay of a few hours. The time required for the *disappearance* of the blue color varies much in different cases of nephritis. In many instances of unquestionable renal disease associated with albumin and casts in the urine, the dye disappears in the course of thirty-six or forty-eight hours, as in persons with normal kidneys. In other patients there is a distinct delay in the disappearance of the methylene-blue from the urine. Instead of quitting the urine in less than three days the coloration persists four, five, six, or even seven days and longer. It is this delay in the *disappearance* of the dye from the urine that is of interest to the practitioner. As already mentioned there is sometimes a delay in the appearance of the blue-green color. Some writers have at-

* In some instances the coloring-matter continues to be excreted for a time in the form of a colorless chromogen. The addition of dilute acetic acid then colors the urine green. Sometimes the excretion is wholly in the form of the chromogen.

tached importance to this, but we do not know enough about the sign to use it in diagnosis. It is certainly true that there are cases of chronic nephritis in which there is delay in the disappearance of the blue-green color without any delay in its appearance.

The elimination of methylene-blue in different forms of nephritis has been studied by Bard and Bonnet. These writers reach the conclusion that in patients with interstitial nephritis the permeability of the kidney by methylene-blue is diminished, that is, delays occur, while in epithelial (parenchymatous) nephritis the permeability is increased; that is, there occurs an acceleration of the normal excretion. This conclusion is based on clinical rather than anatomic grounds. It does not correspond with the unpublished results obtained by Dr. J. W. Conners and myself in the wards of the City Hospital. We employed the methylene-blue test in 98 different patients with and without nephritis in order to determine the clinical significance of a delayed excretion of the methylene-blue. Autopsies were obtained upon only a very small number of these patients, and our results, like those of Bard and Bonnet, were based on clinical observations without anatomic confirmation.

In many instances the test was employed twice in the same patient. There were among our patients several in whom the diagnosis of parenchymatous nephritis seemed justified, but we obtained no evidence that the kidneys in such cases are ever more permeable to methylene-blue than is normal. In fact, delays were noted in some of them. We found nothing to indicate a likelihood that it is possible to distinguish one variety of nephritis from another by the methylene-blue test. Even in the same person, the ability to excrete the blue was found to vary at different times. Thus an elderly woman took at least eight days to rid herself of the usual injection of one grain of methylene-blue, while she was in a uræmic state with convulsions. One month later,

when she was sitting up in the ward, it took less than three days to excrete an equal dose. Among our patients were seven with chronic endocarditis. Some of these had signs of chronic congestion of the kidney. In no instance was any delay noted.

Certain conclusions with reference to the methylene-blue test seem warranted. 1. A distinct delay in excretion is evidence of the inability of the kidney to do its normal excretory work on time, owing to structural alterations, or perhaps temporary disturbances in renal innervation. 2. Such a delay, when prolonged (four days or more) and repeated, is probably associated with an increase in the urea of the blood, and, like such an increase, is to be taken as a sign of latent uræmia, even though definite uræmic symptoms be absent. 3. Periods of delayed excretion may alternate with periods in which there is no delay. 4. The prompt disappearance of the dye, *i.e.*, within thirty-six hours, may probably be taken as an indication that the kidneys are normally ridding the blood of urea, salts, and other urinary constituents, even though the urine contains albumin and casts.

The use of injections of methylene-blue as a diagnostic measure in renal disease is not entirely free from danger in some cases in which the kidney is the seat of advanced lesions. In acute nephritis with partial suppression, and in chronic nephritis with impending uræmia, it may do harm by imposing additional work on organs already overburdened. Well-defined, unmistakable uræmic symptoms forbid the use of the injections. In a very great majority of cases of chronic nephritis there is no objection to their use. When it seems undesirable to administer the methylene-blue by injection, it can be given by mouth. There appears to be no danger from the internal administration of one grain of the dye, except possibly in some outspoken acute uræmias. Normally the blue is eliminated more rapidly when given by mouth than when injected, the usual period being from 18 to

40 hours. The rapidity of absorption influences the time at which the dye appears in the urine, and possibly also affects somewhat the time of disappearance. The method is therefore less reliable than the method by injection. Nevertheless it is useful, and a delay of three, four, or five days in the elimination of the dose is to be interpreted in the same way as if it had been injected.

Potassium iodid also can be given by mouth for the purpose of testing the activity of the kidneys. In normal adults under fifty, a dose of 10 gr. is followed by the presence of the salt in the urine for a period varying from 24 to 36 hours. A delay of more than 40 hours probably indicates some degree of renal inadequacy. Further studies of the behavior of pathologic kidneys toward this salt are needed.

Bacteriuria, or the presence of bacteria in the urine, is, of course, no proof that the micro-organisms have reached the urine from general circulation, by way of the kidneys. Often, however, bacteria do find their way into the urine in this manner. Frequently renal lesions are set up during the transit of the micro-organisms through the kidneys. When this is the case, the bacteriuria becomes an important accompaniment of renal disease in that it may yield information as to the etiology of the affection.

Although this subject is still in an undeveloped state, enough has been learned in very recent years to render desirable some mention of it here. But before considering the different types of bacteriuria known to us it is necessary to refer to certain conditions surrounding the passage of bacteria through the kidneys.

So long ago as 1869, Ponfick, Hofmann, and other observers found that finely divided particles of cinnabar introduced experimentally into the venous circulation pass into the interstitial connective tissue of the kidney or escape from the glomerular capillaries. As the study of infectious diseases was extended it became a matter of interest to learn

whether micro-organisms as well as unorganized particles are capable of passing through the normal capillary walls of kidneys. Grawitz, the first student of this question, found that the spores of moulds introduced intravenously are removed from the blood by the kidney without causing hæmorrhage or any evidence of damage to the capillaries. The view that bacteria traverse renal capillaries without doing them injury was soon vigorously contested by Wissikowitsch and others. For a time it looked as though we must regard the passage of bacteria from the blood into the urine as a process necessarily attended by pathologic alterations in the kidney. Then evidence began to accumulate which showed the original contention of Grawitz to be correct. To-day it is conceded that bacteria can pass readily through the kidney in considerable numbers without leaving behind any demonstrable changes. The evidence, though incomplete, indicates that the glomerular capillaries are a highly important path for the egress of bacteria. The nature of the process by which the transit occurs is unknown, but it may perhaps be compared with the phenomenon of diapedesis of blood-cells. It is, of course, not to be inferred that the passage of bacteria through the kidney is always accomplished without injury to the organ. If their number be large and they are virulent in character the capillaries may be injured so that they permit the escape of blood-cells and of albumin.

The rapidity with which bacteria injected into the venous system make their appearance in the urine has been variously estimated by different observers at from five minutes to several hours. It is on the whole likely that when considerable numbers of bacteria enter the circulation the kidney begins active elimination within half an hour or an hour. The careful experiments of Biedl and Kraus and of Klecki show that the work of elimination does not proceed with equal rapidity on the part of the two kidneys, but that first one organ and then the other is more actively engaged—

an observation entirely in harmony with what is known of the fluctuations that occur in the normal excretion of urine. Biedl and Kraus found that conditions which increased the flow of urine favored the escape of bacteria, but Klecki was unable to confirm this observation. The latter observer found that the use of caffein, diuretics, etc., were without effect in hastening the rapidity of the bacterial escape. These negative results from diuretic agents are of considerable interest from the stand-point of the therapeutist who deals with septicæmic conditions, although they do not perhaps justify the conclusion that diuretics in man are never of service as eliminative agents for micro-organisms. It is a fact of much practical importance that bacteria may be found in the blood when their presence in the urine cannot be demonstrated. This appears from the experiments of Klecki to be due to the inability of the kidney to remove micro-organisms when their number in the blood falls to some point at which they are very few. Why a certain number of bacteria in the blood may fail to come within the range of the activity of the kidney is far from being clear; other physical conditions are probably involved. The fact of practical interest which stands out prominently is that while the normal kidney is exceedingly active in freeing the blood of micro-organisms it is incapable of removing them all. Pathogenic organisms may thus circulate in small numbers for a time before being destroyed or eliminated by other organs.

Several forms of bacteriuria are now recognized as accompaniments of renal disease. In one of these types of bacteriuria is the presence of a particular micro-organism in the urine which is of itself a sign of *renal* disease. But if we leave aside, first, the cases in which bacteria enter the urine through some other portal than the kidney; and second, the cases in which bacteria traverse the kidney without damaging its structure, there remains a considerable class of cases in which the passage of bacteria through the kidney is a

symptom of injury to renal structures. Thus, a tubercle-bacillus bacteriuria is no rare expression of renal tuberculosis which has arisen from the deposit in the kidney of tubercle-bacilli from the blood-stream. Probably about 25 per cent. of patients with typhoid fever have typhoid bacilli in the urine at some period of the disease. Albuminuria appears to be a regular accompaniment of such a bacteriuria. The acute degenerative nephritis of typhoid fever probably depends more on the action of bacterial products than on the micro-organisms themselves, but it is questionable whether such a nephritis is ever absent when typhoid bacilli occur in the urine. In rare instances a typhoid-bacillus bacteriuria is responsible for a serious renal complication—suppurative pyelitis. Again, pyogenic streptococci and pyogenic staphylococci have been found in the urine in various forms of acute nephritis, in the course of erysipelas, malignant endocarditis, osteomyelitis, scarlet fever, etc. These organisms have also been found in the urine in cases of perirenal abscess, pyelonephritis, suppurative nephritis, etc. Here the bacteria found in the urine have stood in a causative relation to the renal lesions. In the case of acute nephritis, however, it does not necessarily follow that the streptococci or staphylococci found in the urine have been the cause of the renal lesions. Thus in scarlet fever, it is in the highest degree likely that the peculiar glomerular lesions often found in this disease are due to unknown poisons rather than to any of the bacteria found in the kidney or its products.

There is some evidence that the urine of acute nephritis at times contains pathogenic cocci differing from the ordinary pyogenic cocci. Thus Mannaberg found in eleven cases of acute nephritis a micro-organism possessing peculiar cultural character. When the nephritis cleared up, these organisms could no longer be found in the urine. Another observer, Engel, claims to have found a hitherto undescribed pathogenic coccus in seventeen out of thirty-one cases of ne-

phritis, acute and chronic, selected at random. In acute cases the staphylococcus pyogenes aureus and the staphylococcus pyogenes albus were frequently found in association with this new coccus. The significance of these two sets of observations remains to be settled through further work.

The importance of bacteriuria for renal pathology is not limited to those forms in which the micro-organisms enter the urine by way of the kidney. The damage which may be done the kidney by the ascent of the gonococcus and of the tubercle-bacillus from the bladder or urethra is now well recognized. It is perhaps not so well understood that even bacteria which merely decompose the urine with the liberation of ammonia, such as the bacteriuria and micrococcus ureæ, are a threat to the integrity of the kidney by their ability to set up a severe pyelitis or convert a slight suppurative process into one that menaces life.

What is perhaps the most remarkable form of bacteriuria remains to be mentioned. This is the variety characterized by the presence of a larger number of colon-bacilli in the urine. The urine in this condition is slightly turbid, even when first passed, and this turbidity does not clear up on standing. Sometimes a moderately abundant whitish sediment appears after a short time. The reaction is acid. Frequently the urine has an indescribable unpleasant odor, and it is often this that causes the patient to consult his physician. Albumin is absent unless there be some associated pathologic state. Microscopic examination of the sediment fails to disclose the presence of pus-cells, or such cells are present in small numbers only. On the other hand, short rod-shaped bacteria are found in large numbers. In all the cases that have been studied these bacteria have developed the cultural characters of colon-bacilli.

Patients with colon-bacillus bacteriuria frequently do not complain of any definite or characteristic symptoms. Sometimes fever is present for a time. Intestinal disorders ap-

pear to be common; probably some intestinal disturbance occurs in all cases, though well-defined symptoms may be lacking.

Although this form of bacteriuria sometimes occurs without further clinical signs than those just referred to, it is very common for the condition to be associated with some morbid process in the genito-urinary tract, such as nephritis, pyelitis, cystitis, prostatic disease, etc. Whether colon-bacillus bacteriuria is ever the cause of nephritis is a question which cannot at present be answered. It is certainly responsible for numerous instances of pyelitis, the colon-bacillus being especially effective in setting up catarrhal inflammation where the mucous membrane has already been injured by the action of concretions in the renal pelvis.

The earlier writers upon this condition thought that the urinary tract became infected from the exterior, through the introduction of contaminated catheters, through wounds connecting with the bladder or urethra, and in similar ways. Recent studies, especially those of Rövsing, make it clear that this is by no means the chief avenue of invasion. The evidence points unmistakably to the conclusion that the micro-organisms reach the urine from the blood-stream through the kidney, in that considerable number of cases in which urethral infection can be excluded. How the bacteria enter the blood-stream is not positively known, but the probability is strong that they come from the intestinal tract through some breach in the continuity of its mucous membrane. The clinical associations of colon-bacillus bacteriuria speak for this interpretation. Habitual constipation, intestinal catarrh, intestinal hæmorrhage, carcinoma of the intestine, and typhoid fever are among the obtrusive pathologic states of the intestine with which bacteriuria has occurred. The relationship of bacteriuria to the gut opens a fruitful field for experimental study.

The prognosis in cases of colon bacteriuria is usually good.

Patients may for years pass large numbers of colon-bacilli with the urine, either continuously or periodically, without failing in general health, and without developing local disease in the urinary tract referable to the action of the bacteria. On the other hand, it sometimes happens that a pyelitis or other local inflammation in the urinary tract can be reasonably referred to the action of the swarm of bacteria which constantly pass over a part lowered in vitality by slight traumatisms from calculi. Colon-bacillus bacteriuria often resists treatment stubbornly. The internal use of moderate doses of salol, combined with the free drinking of water, has been found helpful. Those who desire further information upon the subject of colon-bacillus bacteriuria are referred to the recent admirable work of Rövsing on infectious diseases of the urinary organs.

Let us now consider some of the additions to our knowledge of the causes of renal disease that have come to us in recent years. The element in the causation of lesions of the kidney that now stands out more prominently than any other is infection. There is no longer any mystery about the lesions of renal tuberculosis, of pyelitis, or of suppurative nephritis. Bacteriology had made plain the rôle of the tubercle-bacillus, of the common pyogenic bacteria, of the gonococcus, of the colon-bacillus, etc., in the production of most of the local diseases of the kidney. Important as are these accessions to our knowledge of the etiology of renal disease they are not those which I wish to emphasize here. I desire especially to refer to the rôle which infection plays in the causation of the group of renal lesions that constitute Bright's disease. One of the objects of investigation is to determine whether there are any definite relations between types of infection and anatomic types of nephritis. In this we have hitherto met with only partial success, but there are unmistakable indications that our understanding of these relations will in time be greatly broadened. That definite

knowledge we have relates especially to the various acute forms of nephritis. We have learned that there are many kinds of infection that are capable of producing an acute degenerative nephritis. Experimental as well as clinical studies show that this lesion may follow infection by the staphylococcus pyogenes aureus, the Klebs-Löffler bacillus, the cholera bacillus, etc. If, however, the pathogenic properties of the staphylococcus pyogenes and of the diphtheria bacilli are more intense the alterations in the kidney may not remain confined to its epithelium, as in acute degenerative nephritis, but may lead also to an infiltration of the connective tissue with lymphoid and allied cells—thus setting up an acute interstitial nephritis. Both in diphtheria and in scarlet fever we meet with those alterations in the tufts of the kidney which characterize an acute glomerular nephritis. Thus the infection of diphtheria may be associated with an acute degenerative nephritis, an acute glomerular nephritis, or an acute interstitial nonsuppurative nephritis. I say "associated with" rather than "caused by" because, in the case of the human subject, it is not yet quite clear that other infections besides that of diphtheria may not have been responsible for these lesions. The evidence, however, strongly favors the view that in some instances the same species of microorganisms is capable of setting up different histologic lesions in the kidney, according as it varies in pathogenic properties. Whether there are certain kinds of infections that invariably lead to the production of a particular type of acute lesion in the kidney, and never to any other, is not yet clear. We have learned that the lesions of acute nephritis can be set up without the agency of the bacteria themselves, through the action of their secretions. It has been shown by Welch and Flexner, in the case of diphtheria, that "the lesions in the tissues produced by the bacilli and toxic principle on the one hand, and the toxic principle alone on the other, are in perfect correspondence with each other."

There is every reason to believe that the acute nephritis that accompanies diphtheria is set up by the action of the soluble products of the Klebs-Löffler bacillus rather than by the bacteria themselves. In the case of the staphylococcus pyogenes aureus it has been demonstrated experimentally by Morse that interstitial lesions can be set up in the kidney through the injection of the filtrate from this organism. These experimental results, together with certain bacteriologic studies of human kidneys, make it probable that many histologic alterations in acute nephritis in human subjects are due mainly to the soluble products of pathogenic bacteria.

In many instances the lesions of acute nephritis are the result of combined infections, and the damage done by such a combination may be greater than that referable to either element singly. Thus Flexner's experimental observations lead him to infer that in their action upon the tissue-elements, including those of the kidneys, the combined toxins of the bacillus-diphtheriæ and the streptococcus pyogenes are more potent than either toxin alone.

A large proportion of all cases of acute nephritis in its different anatomic forms can be referred to a few common varieties of pathogenic organisms. The pneumococcus, the pyogenic streptococci and staphylococci, the bacilli of diphtheria and of typhoid fever, and the plasmodia of malaria, separately and in various combinations, are responsible directly or through their secretions for many cases of acute nephritis. If we add to these the renal lesions caused by infectious diseases of unknown nature, such as scarlet fever, measles, syphilis, and influenza, the number of acute cases unaccounted for is by no means large. It is true that there are acute and subacute cases, many of them presenting glomerular lesions, which have the clinical aspect of primary nephritis, or seem to be due to exposure to cold. There is reason to think that these, too, are really the result of infection, though this has not yet been proved. Then there is

the acute form of nephritis, which depends on metallic or other non-bacterial irritant poisons. The cases in this group are not numerous. Those due to metallic poisoning show merely the lesions of acute degenerative nephritis and congestion. I have made repeated efforts with different metallic poisons to experimentally induce glomerular and interstitial lesions in rabbits and dogs, but have regularly failed.

The difficulty in determining the relation between types of infection and types of nephritis is much greater in the case of chronic processes than in those which are acute. This is partly because of the multiplicity of influences which may play a part in the production of chronic nephritis and partly because many of these influences operate gradually and through long periods of time. The experimental observations of Morse, already referred to, indicate that the toxins of the staphylococcus pyogenes aureus are capable of initiating those proliferative changes in the interstitial connective tissue of the kidney which constitute so prominent a lesion of chronic diffuse nephritis. It is probable that the toxic products of numerous forms of pathogenic bacteria are capable of inducing such connective-tissue changes. Clinical observations make it well-nigh certain that scarlet fever is often followed by chronic nephritis; a sequence which cannot be accounted for except through the relation of cause and effect. Certain isolated cases, like the one reported by Eisenlohr, make it exceedingly probable that the infection of typhoid fever is competent at times to set up the lesions of chronic nephritis through the mediation of an originally acute process. As recently pointed out by Thayer, there is very good evidence that chronic nephritis is not infrequently a consequence of the severer forms of malarial infections. Although there are many clinical reasons for thinking that the granular kidney may be a sequel of other forms of infection, for example that of pneumonia, influenza, and measles, the positive proofs are probably lacking. At present

scarlet fever is the disease which we must hold most often responsible for chronic diffuse nephritis with contracted kidneys.

The form of chronic nephritis known as amyloid kidney has long been a highly interesting enigma to clinicians and pathologists. Three etiological associations of this condition have come to be generally recognized—prolonged suppuration, tuberculosis, syphilis. It is one of the achievements of experimental pathology to have shed some light on the nature of the underlying cause of amyloid degeneration. Recent experimental studies by Cracow, Maximoff, Davidsohn, Nowak, and Lubarsh, make it clear that the filtrate of cultures of the golden staphylococcus is capable of inducing amyloid degeneration, especially in the spleen and liver, but also in the kidney. By means of repeated injections the amyloid change was readily produced in the hen and somewhat less regularly in the rabbit. The amyloid material thus produced corresponds closely with that found in man. It seems certain that the long-continued action of staphylococcus toxins on the human kidney is capable of inducing amyloid changes in it. These observations give us a satisfactory explanation of the influence of prolonged suppuration. It is not known whether the amyloid alterations found in syphilis and in tuberculosis are due to the peculiar poisons of these diseases or to the part played by the staphylococcus in cases where there is mixed infection. It is not impossible that products of other bacteria than the staphylococcus lead to the amyloid change.

Although the time is still distant when it will be possible to write a satisfactory account of the agency of derangements of metabolism in the production of renal disease, there are facts which indicate that such derangements stand in an important etiological relation to pathologic changes in the kidney. Thus it is certain that an acute degenerative nephritis sometimes follows severe entero-colitis in children

under such conditions that the renal alterations can only be interpreted to result in some way from the morbid process in the enteric tract. Similarly, but more rarely, albumin and casts have been observed in the urine of adults during acute enteritis. It can hardly be doubted that the explanation of this relationship between gut and kidney is to be sought in the occurrence of pathologic bacterial activity in the intestine. Not only does the colon bacillus sometimes take on distinctly pathogenic qualities—the intestine may be infected by the streptococcus pyogenes, the proteus vulgaris, etc. To what extent and under what conditions these and other micro-organisms may be concerned in producing nephritis, directly or through their soluble toxic products, cannot now be stated.

That chronic lesions of the kidney result from a combination of acute and chronic disorders of digestion is more difficult to prove than that acute lesions sometimes follow acute disorders. This is owing to the fact that it is rarely possible to exclude other causes of chronic nephritis. Careful clinical observations, however, lead me to think that a general arteriosclerosis in rare instances has its beginning in a series of acute seizures of gastro-enteritis, which leave behind them marked impairment of intestinal digestion. When this occurs in persons under 25 years of age, whose accessible arteries have previously been healthy and who have had none of the infectious diseases that are known to dispose to arteriosclerosis, there can be little question that the gastro-enteritis stands in a causal relation to the alterations in the vessels and to the simultaneous changes in the kidney.

Whether it is possible to induce chronic diffuse nephritis in the human kidney merely through increasing for a long time the normal work of the kidney in the elimination of urea and other nitrogenous extractives, must be regarded, I think, as questionable. Time does not permit me to discuss this question as I could wish. I may perhaps be permitted

to refer to what is only a clinical impression in this connection. It is that the normal kidney is capable of doing an abnormally large amount of work for a long time without developing chronic vascular lesions, so long as this work remains normal in character. When, however, the quality of the work becomes abnormal through chronic derangements of digestion, the likelihood of arteriosclerosis seems to be materially increased.

In concluding these unsystematic observations on the causes of renal disease, I wish to speak of a much discussed theme—the influence of excess in alcohol. While some writers have looked on alcoholic excesses as an important cause of the small granular kidney, others, including Dickinson, Austin Flint, and Lancereaux, have brought this opinion into question. In the hope of obtaining some information on this subject, I have analyzed a considerable number of autopsies with reference to the weight of the kidneys, in three groups of adult patients: first, those giving a distinct history of excess in alcohol; second, those giving a history of a moderate use of alcohol, and third, those in which there was no history of the use of alcohol. Those three groups yielded 468 autopsies in which the weights of the kidneys were recorded. Looking at the cases in which each of the two kidneys weighed less than 4 oz., that is to say, in which the organs belonged to the contracted type of chronic diffuse nephritis, it was found that there were about 13 per cent. of the small kidneys in the non-alcoholic group, 8 per cent. of the moderately alcoholic group, and less than 6 per cent. in the markedly alcoholic group. These figures certainly lend no support to the idea that small granular kidneys are caused by alcoholic excess. Looking at the autopsy records with reference to the distribution of the large kidneys (that is, those weighing more than 6 oz. each), it is found that there are 29 per cent. of these in the non-alcoholic group, 45 per cent. in the moderately alcoholic group, and nearly 40

per cent. in the markedly alcoholic group. It is difficult to resist the inference that alcohol is influential in the production of nephritis with large kidneys rather than nephritis with small kidneys. There are two facts which speak in favor of this view. One is that the kidneys of drunkards dying of acute alcoholic intoxication often show the large congested and œdematous kidneys which were described by Formad as the pigback kidney. The other fact is that a chronic albuminous and fatty degeneration can be induced experimentally in the kidney of the pig by means of chronic alcoholic intoxication. I have succeeded in bringing about this change in young pigs kept for ten weeks almost continuously under the influence of alcohol—from two to four ounces being given daily. The kidneys were large and pale, the tubules distended, the epithelium granular and fatty. There were no interstitial changes. Alcoholic gastritis was also found.

On the whole, I think the evidence points strongly, if not conclusively, to the view that the early lesions of nephritis from alcohol lead to enlargement of the kidney. It is extremely unlikely that these large fatty kidneys ultimately contract. The belief that the small granular kidney is one of the sequels of alcoholic excess rests on a very insecure foundation.

In the last fifteen years, by the addition of one observation to another, we have quietly accustomed our minds to a conception of the etiology of nephritis that is nothing short of revolutionary. Instead of looking at nephritis as a primary disease of the kidneys due to exposure to cold, or "idiopathic" in nature, we have come to see in the different anatomic types the evidence of different reactions on the part of the renal, vascular, epithelial, and connective tissue-cells toward toxic substances or micro-organisms brought by the blood-stream. To-day we accept this idea as a matter of course, but it is nevertheless a novel conception of the origin of nephritis. It gives us a wholly different view of the posi-

tion of the kidney in human pathology. It explains why it is that in persons more than twenty years of age it is exceptional to find at the autopsy-table kidneys that are wholly normal. It opens our eyes to the fact that we should never be satisfied with a mere diagnosis of nephritis, but should always look for enlightenment to the pathologic process or processes to which the renal lesions are secondary. In chronic lesions this is often beyond our power; in acute lesions of the kidney we have already won a considerable though partial measure of success in tracing the pathologic antecedents.

The broader outlook which we have reached through the modern study of the etiology of disease helps us greatly to understand the important lesions so frequently associated with those of nephritis. How often the liver and spleen suffer from the same influences that lead to nephritis is now well understood, though many important correlations remain to be worked out. The relation between the wide-spread vascular lesions that so commonly go hand-in-hand with the vascular changes in the kidney has to-day become the subject of commonplace discussion, but the conception is modern and is not perfected even now. One other relation of the diseased kidney to the organism at large remains to be noted. The kidney which is no longer adequate to bear the entire burden of its normal work becomes a source of danger to other tissues. We do not yet know the nature and full extent of the pathologic consequences to the organism that arise through such inadequacy, but we recognize the grave disturbances of nervous function that are the clinical manifestation of this condition of uræmia.

These different considerations impress us as clinicians with the necessity of looking on nephritis lesions as processes intimately related to other parts of the organism and not as local diseases. If we overlook these manifold rela-

tions in formulating the prognosis and treatment of nephritis, we are losing the fruits of modern investigation.

It may be questioned whether our views of the origin of renal disease will ever undergo so radical a change as that which the past twenty years has witnessed. This enlightening change we owe not to a narrow specialism in the study of the kidney, but to that development of scientific methods in the domain of general pathology which marks the progress of medicine as a department of biology.

I am under especial obligations to Dr. John S. Thacher for the use of numerous histological preparations from the Pathological Department of the Presbyterian Hospital. I desire also to acknowledge the courtesy of Dr. A. H. Smith, Dr. Kinincutt, Dr. Thompson, Dr. James, and Dr. Northrup, in permitting me to refer to certain medical histories of patients in their care.

MEMORIAL ADDRESS ON JOSEPH O'DWYER, M.D.

BY W. P. NORTHRUP, M.D.

Joseph O'Dwyer, M.D., the inventor of intubation, died at his home on Lexington Avenue, New York, January 7, 1898, in the fifty-seventh year of his age. He was born October 12, 1841, in Cleveland, O.; spent his boyhood near London, Canada, in which city he went to school; and took his first studies in medicine with Dr. Anderson. He began his lectures in the New York College of Physicians and Surgeons in 1864, graduating in 1866. Just at this time the staff of the Charity Hospital on Blackwell's Island was made a separate body, and as the result of competitive examination Dr. O'Dwyer took first place, and was thereby constituted Sanitary Superintendent of the institution. It was his duty to inspect the plumbing, the wards, the kitchen, and the food supplies. Dr. J. Lewis Smith was fond of saying to the younger men connected with the Foundling Hospital that he well remembered examining Dr. O'Dwyer for the staff appointment, and that he—O'Dwyer— passed an excellent examination. Among the internes were Dr. Le Roy M. Yale, Dr. F. A. Castle, and Dr. Peter Inches, now of St. John's, N. B. The visiting staff of the Charity Hospital was practically the same as that of Bellevue Hospital, and included Drs. J. Lewis Smith, A. L. Loomis, Austin Flint, Van Buren, L. A. Sayre, and Frank Hamilton.

A few cases of diarrhœal disease had been observed in the city, but had not been recognized as cholera. One night a severe case of so-called cholera-morbus was an-

nounced at the workhouse, was suspected, and was isolated. Fifteen days later sixteen persons came down with true cholera in one night, "and," to quote the words of one of the staff, "it came down the island pell-mell." Two hundred cases broke out in the workhouse. Dr. O'Dwyer, being Sanitary Superintendent, had charge of all arrangements for fighting the epidemic of cholera.

The fever hospital was located on the island, and to this were sent typhoid and typhus fever patients. During 1863-64 cases of typhus occurred sporadically in the city, and about the time of Dr. O'Dwyer's service cases broke out on the island and typhus became epidemic. Many before me remember that period, and the younger men are familiar with the marble slab of the lower lecture-room, upon which were inscribed the names of the "ornaments" of the profession who succumbed to the fever while in discharge of their duty. Dr. O'Dwyer contracted the disease.

As Sanitary Inspector he had visited the workhouse on an urgent call, finding a patient early in the morning in the first onset of the disease. The patient was in a close, unventilated cell. Dr. O'Dwyer often said he knew the moment when he contracted the disease. It was while examining that man in that stuffy cell, before having had his breakfast. Promptly at the end of the usual period of incubation he was seized with the well-remembered pains in the head and back. Deliberately he finished his work, wrote out his wishes as to the disposal of his things, left letters for his friends, and went to bed. He remembered examining his eruption; assured that his case was a genuine one, he made his estimate of its severity, and shut his eyes to wait. Then followed days of which he could never give any account. His recovery was complete, without complications or sequelæ, and without impairment of any of his powers.

Dr. O'Dwyer chose what was called long service or full time on the staff, and the next we know of him (1868-69) he was Examining Physician of patients applying to the hospitals under the Board of Charities and Corrections. He was examiner and distributer of patients, sending some to Bellevue, some to Charity. About this time also he opened an office with Dr. Warren Schoonover, on Second Avenue, between Fifty-seventh and Fifty-sixth Streets. He worked into a large practice in obstetrics, reaching ultimately the number of three thousand cases, including miscarriages.

In 1872 Dr. O'Dwyer moved to Lexington Avenue near Sixty-fifth Street, in close proximity to the New York Foundling Asylum, which had likewise moved uptown and was about to open its new building (1873). Upon the new staff of this institution were Drs. Reynolds, J. Lewis Smith, and Joseph O'Dwyer.

From 1873 to 1880 tracheotomy was on trial in this institution, without a recovery. In 1880 Dr. O'Dwyer "began thinking" on croup, and some method for providing a channel through the larynx for the passage of air and secretions, without the complication of an open wound. How to hold apart the swollen false and true vocal chords till the disease should run its course, and the stenosis be thus relieved—this was his first thought. The most natural resource was a skeleton wire spring. This, however, soon gave way to a small bivalve speculum, formed on the model of a bivalve vaginal speculum. It was fitted with a spring to force the two valves asunder when placed in position. To keep the valves together during insertion, the introducer or handle curved on a right angle passed down through the hinged end, then through an eyelet on one valve; then, the valves being approximated, the pointed handle passed through a second eyelet on the other valve. Thus the valves were held

close together until released by withdrawing the handle, when they sprang apart. This laryngeal spring, or speculum, served to keep the air passages open, but had important faults. The interval between the open valves allowed the swollen mucous membrane to crowd in, and ultimately to cause stenosis again. It did not sink too low in the larynx, because of a rubber collar—gutta-percha dissolved in chloroform, applied layer on layer.

A great deal of experiment was required to get the spring of the proper strength. If too weak, it would not separate the blades; if too strong, it would cause ulceration from pressure. The mouth gag had not been devised at this time. The index finger of the left hand wore a shield in operations. It consisted of two metal discs, about the size of a silver quarter of a dollar, bent to fit the shape of the finger on the proximal phalanx, the dorsal and palmar discs being held together by rubber elastics.

The following is the first intubation recorded in the dead-book of the New York Foundling Hospital:

"October 21, 1882, Dr. G. M. Swift, H. P——, female, aged four years. October 20th, severe croup; pseudo-membrane in pharynx; dyspnœa urgent, temporary asphyxia; relieved by introduction into larynx by Dr. O'Dwyer of one of his 'springs.'

"Eight hours later, spring having been removed, the child again became asphyxiated. The subsequent history is: tracheotomy, death.

"Autopsy: Pseudo-membrane in pharynx, larynx, trachea, and bronchi to finest bronchioles—continuous, tenacious, thickness of wet blotting-paper."

Third recorded intubation: "January 26, 1883. Diphtheria—larynx. Under chloroform, O'Dwyer, at 1.40 A.M., introduced his spring. Relief followed. In about ten minutes, after a cough, there was complete obstruc-

tion to respiration, and the child was apparently dead. Spring plugged with a piece of membrane, one and one-fourth inches long, the lower end being cylindrical. Removed; artificial respiration restored child. A larger spring, introduced seven hours later, gave relief. Five hours later the spring was removed, but immediately there were restlessness and cyanosis; spring reintroduced and dyspnœa relieved. Tracheotomy was refused by its mother, and the child died."

Thus far two points had been demonstrated: First, that the larynx would tolerate a tube; second, that air could gain entrance and the secretions find exit. Note that his only idea at first was to keep a channel temporarily open for the short distance between the false vocal chords and the beginning of the trachea. If this could be accomplished for five days, ordinarily the storm would have passed.

The bivalve laryngeal speculum or spring, with all its faults, had a recovery to its credit. This was the first operated case of membranous croup to terminate in recovery in the thirteen years the Foundling Asylum had been in existence.

However, after three years of experience the idea of accomplishing the desired result with a bivalve laryngeal speculum was abandoned. With the instrument there was also difficulty in feeding, the same that so much embarrassed the success of later tubes.

About this time Dr. O'Dwyer learned of the work of Bouchut, of Paris, in tubage of the larynx. Nothing could induce him to inform himself fully on this man's work. All he knew was that the tube was like a thimble and was never pronounced a success. He resolutely shook his mind free, for he said that unless he worked out his own ideas alone that would be the end of his work. After some time, studying the larynx healthy and the larynx swollen

and lined with pseudo-membrane, O'Dwyer appeared one day in the dead-house with a new tube—a tube this time longer than the speculum, narrow, oval, or flattened laterally, having a collar at its upper end. To use his own description, it was "a tube of plain oval form, about an inch in length." The first mention of a "tube" occurs in a recorded history in the dead-book, April 25, 1884. "Dr. O'Dwyer put in 'tube' at night; dyspnœa relieved; breathing fairly good till death, sixteen hours later."

In connection with this case a foot-note to the history states that the question whether the lungs were in collapse or pneumonic was of much interest to Dr. O'Dwyer. He and Dr. J. H. Ripley, who had been for years very good friends, discussed at great length this question, Dr. Ripley contending that the lungs in such cases did not show pneumonia, but collapse. One thing is certain, Dr. O'Dwyer was much pleased with the continued relief for sixteen hours afforded by this tube, and it was not coughed out.

The second trial with this tube resulted, after certain vicissitudes, in recovery. The patient was a girl, four years old. The tube was removed after sixty-seven hours, but required reinserting after five hours. The patient shut her teeth tightly upon the metallic shield upon the finger, and imprisoned the doctor until chloroform relaxed her jaws. The tube was then inserted, coughed out in three days, and not again required. This was the first recovery in intubation, and I may mention that about this time the name "intubation" was adopted for the operation. Here was a patient recovering from intubation. The next inquiry was, what would be the condition of the vocal chords? Would the voice return? Several weeks passed, and the child was aphonic. The cough, however, had an explosive quality which meant that the chord had not ulcerated away. The voice ultimately returned.

A new need was presented by this four-year-old patient: a mouth-gag must be devised. The first gag was much like that now in use, except that the handles, or levers, were curved on a right angle, hanging down by the child's neck, and a clip, by gravity following along down as the levers approximated, held them together. The child in hitching up its shoulders occasionally dislodged the gag, and the modification made by Dr. Denhard, of continuing the handles out toward the ear and using a spring clip, was adopted and is still in use.

The pathologist at the Foundling Hospital during these years had many interesting friends about the autopsy table; many interesting discussions warmed that lugubrious underground cell. The autopsy book contains, for instance, two full pages devoted to the history of a case, with autopsy, the main points of controversy between Drs. O'Dwyer and Ripley, microscopic findings of the specimens, etc. It was the old discussion of pneumonia or collapse following croup and operation. This case was specially referred to me, as pathologist, to decide, Dr. Blodget, house physician, being witness to the points under discussion. Fortunately, this chosen case furnished abundant evidence of both collapse and beginning pneumonia, the verdict being confirmed by Dr. Delafield's examination, and the question was not settled. A little sidelight may be thrown upon this scene. Tracheotomy, of which Dr. Ripley was a great champion, was probably to have in intubation a competitor.

Difficulties were still to be met. This tube, for instance, which was retained and afforded relief, contained a little slit into which the extractor hooked in removing the tube. Into this likewise the mucous membrane hooked and held it fast, not without harm to the soft tissues when it was being removed—so the slit must be dispensed with.

The tubes must be made longer to reach to the bifurcation. These, it was thought, would not be coughed out, and so they were not, because, having ridden up to the vault of the pharynx, they could go no farther, and an ever-present nurse could push one down again. Then came a second shoulder below the contact of the vocal chords—an abrupt shoulder above, a vanishing wedge below, the chords resting in the interval between the two shoulders. This tube remained too well; it was almost impossible to get it out, *i.e.*, to get the chord out of the groove. This was abandoned. Then came a long period of thinking, of measuring larynges, of modelling putty upon the middle of the tubes, and putting them into specimen larynges, of taking plaster casts. The result came at last in the form of the retaining-swell, which was a fusiform enlargement of the middle portion of the tube lying within the trachea. Within the trachea was plenty of room. The cricoid ring (and this was rather an incidental discovery of Dr. O'Dwyer's) is the narrowest place in all the respiratory ways. These tubes caused pressure and ulceration at these places, at the base of the epiglottis, within the cricoid ring, and at the lower end of the tube. The epiglottic ulceration was obviated by giving the upper portion of the tube a backward curve, thickening and rounding the portion which pressed against the epiglottis in deglutition. The cricoid ulcers were difficult to overcome, and all final success depended on one thing. Unless a child could breathe through a tube much smaller in calibre than would seem possible at the first glance, intubation could never take its place as a successful operation. Here, consequently, began the process of thinning the tube's walls and reducing the calibre. After reducing pressure to the point of safety to the mucous membrane, it was found (what has been the marvel of everyone

viewing the tubes for the first time) that a child could breathe perfectly through an exceedingly small tube.

Few had occasion up to this time to reflect, I believe, as to how much motion the parts about the larynx take on in every act of swallowing. With the new tube held firmly in the larynx and cricoid ring, every act of swallowing pressed the tongue hard down upon the epiglottis, and it upon the tube's head; at the same time the lower end of the tube rode up and down for half an inch upon the mucous membrane, and, with the early tubes, dug its way in, leaving bare the tracheal rings. To obviate these drawbacks, the lower extremity was thickened and rounded into a smooth knob. Let us bear in mind that the backward curve, the blunt, rounded head of such odd shape, the knobbed lower end, with the thin-walled laterally compressed upper end (of the tube) were the results of long, painstaking study and experiment, measurements and casts, trials of models, changing and changing for six years.

The earliest specula, springs, and tubes were made by a German, far down town, who was clever enough in his way, but his way was troublesome. To meet him O'Dwyer had to go to his shop, when, finding it vacant, he would hunt the nearest gardens and saloons. Sooner or later he would find him and sit by him till the work was done. He was the only man whom he knew would do what he wanted, and do it in his way. Later he had better fortune in the instrument-maker he employed for years, and who alone still continues to make O'Dwyer tubes, that is, tubes as he wished them.

After all the six years of thinking, trying, and changing, what happened the moment the tubes were put before the public? There was no patent to restrain any maker. He could make O'Dwyer's tubes, as many as he liked;

and never a maker who looked at them admitted for a moment but that he could make them—yes, make them exactly, just a copy of them, faithful to the model. What did these complacent makers do? They never took a thought of such a thing as a backward curve. As for the head being that odd shape, what difference if they make it a trifle more simple? Even the rounding of the edges did not appeal to them. As for the swell, that was satisfactory; and the lower end of the tube—why, they left it sharp. At O'Dwyer's request, I picked up in London and different places samples of tubes that their best makers were selling, and tubes made from models sent out from New York with O'Dwyer's approval. They were a travesty. They embodied every vice. There was only one way they could be made worse, and that was by indenting the cutting edges like a buzz-saw. They would be ludicrous, were they not cruel. The English made the worst possible intubation instruments. Little wonder they were not pleased with their first results. This was to O'Dwyer one of his secret grievances in life. "Bad tubes!" he would say; "bad tubes!"

The perfect intubation tube of to-day is made of hard rubber. Upon it lime salts do not form to tear the mucous membrane; it does not corrode, does not require replating; it is boiled and disinfected with the utmost freedom; it can be worn indefinitely without removal. The hard-rubber tube, children's size, is the latest improvement from the hand of the inventor—O'Dwyer.

Difficulty in feeding was one of the great drawbacks to the success of intubation. Diphtheria patients must be fed these five days of tube-wearing. Finally, the Casselberry method was a great relief. Dr. Casselberry, of Chicago, fed a patient who had lost his epiglottis through tuberculosis, by making him swallow up-hill. If fluids

entered the trachea, they instantly gravitated out. This method he applied to intubated patients, with great joy to Dr. O'Dwyer.

Two years after intubation was given out fully to the public, and half a year after the first ovation to its inventor at the International Medical Congress in Washington,* Mrs. O'Dwyer died. For those who knew the man it is not difficult to understand how much he needed all that is comprehended in the word "home." He was a retiring man, of few words, always thinking, sensitive, conscientious, diffident. If any near friends were asked what was the one thing most necessary to a man of Dr. O'Dwyer's disposition for his contentment and happiness in life, the answer would be, "A congenial home atmosphere." If asked what kind of a wife was required to produce such congeniality, they would say one who was hopeful, sympathetic, encouraging. If we add to these qualities beauty and absolute devotion, we have a fair picture of Dr. O'Dwyer's chosen companion. No published report on intubation, no fleeting gossip, no current views and criticisms escaped her. No friend who called ever missed an opportunity of telling Mrs. O'Dwyer any favorable experience or report on intubation. To see her drink it in, to see her handsome face and eyes light up, were ample recompense for a little trouble. Equally entertaining was the doctor's quiet chuckle and remonstrance. Her visit to Washington, when intubation had its first ovation, at the International Medical Congress,

* Referring to the above, I have received the following:

"DEAR DOCTOR: You made a mistake which you will be glad to correct, in speaking of the "first ovation to Dr. O'Dwyer at the International Congress of Washington." The first public appreciation of his work, amounting to an ovation, was that of the State Medical Society, February, 1887.

"Very sincerely yours,

"A. JACOBI."

was an occasion of the highest degree of wifely pride and rejoicing.

Dr. O'Dwyer was a poor sleeper from the time he began thinking on intubation. The thoughts of the day clung to his brain at night, and sleep was at first broken, and at length absent, for the greater part of consecutive nights. After the death of his wife followed the years in which intubation became popular in New York, and his door-bell rang much at night. Even though he did not go out, he could not sleep again. Once a tube was inserted in a child's larynx his anxieties began. The operation was new; the accidents were all reported to him from the whole world. These worried him. Not to dwell too long upon the subject, his whole tranquillity of mind was destroyed, and sleep was gained only with greatest difficulty. Another point I wish to make is that with all this struggle to sleep, and frequent recourse to sleeping-medicines, he never was bound by any drug habit. To my mind, watching him as I have for months and years, the strength of character shown in this respect is unequalled by any other example. Intubation destroyed his ability for sleep, it broke his health, it made him prematurely old.

If I were asked what was the chief characteristic of Dr. O'Dwyer's medical excellence, I should say his habit of thinking and his good logic. He had a good medical mind, good medical judgment—that quality which allows a man to grow after the age of forty. Physiological subjects connected with respiration interested him much. Why a lung expands after an empyema is operated upon was one of his night cogitations. He was a man of few words, but a short conversation with him was sure to set one thinking. He wanted to ask everybody some question—if a laryngologist, he had numerous questions; if a

neurologist, orthopædist, ophthalmologist, he had questions for all. Some question had come to him in the night, or in the street-car, and he saved it until by chance he met the specialist who could answer it. In later years his vision was not good and he read less. Again he was reduced to thinking. He was a recluse, and reflection was his refuge.

To the New York Foundling Hospital, with which he was connected for twenty-five years, Dr. O'Dwyer was everything. To the maternity service he was the expert obstetrician; in intubation, he was the teacher; in general service, his was the constant consulting mind; to the Sisters of Charity, he was the physician, the friend, the general regulator of the household. All adored him.

Few know that Dr. O'Dwyer had attended three thousand confinements. Dr. Henry Blodget, one of our internes, who had taken a special and extended course in obstetrics in Vienna, one day exclaimed: "In his own way Dr. O'Dwyer had come to practically the same methods and results as those of my Vienna teachers, and there's nothing he has not seen!"

Of Dr. O'Dwyer's last illness, Mr. President, I have not the heart to write. He longed for sympathy and friendly encouragement, and so would be pleased with this meeting; but the one paper which he would beg to have suppressed is the one to which you are now listening. As to the rest of the papers, they would be a pride to his boys.

In his early life Dr. O'Dwyer was taken with pulmonary hæmorrhage. For three years he lived in the woods of Michigan, a member of a surveying party, and ever since counted himself a case of consumption cured. For several years he had been rather feeble. His walk suggested effort. In the morning he was languid and dull. His only good sleep came to him about the time that early callers were liable to pull his bell. He was fatigued easily, and

had but little resiliency. With all this sleeplessness, languor, and easy fatigue, reflect upon his record of things accomplished! Thinking was left to him, even when his eyes weakened.

Whatever forces wrought it, whether a combination of physical weakness, the mellowing influences of religion, the chastening of affliction, and the constant devotion to his motherless boys, Dr. O'Dwyer's was the most godlike character I have ever seen in man. There was an abundance of spirit. He could be very angry—a sort of justified indignation—but this feeling found only temperate expression. He was ambitious, but scrupulously careful to recognize the contributions of others. His ambitions were, after all, largely to have his boys think well of his achievements.

O'Dwyer was as peculiarly sensitive to every criticism on intubation as though it were his bride or his baby. It worried him that such imperfect and cruel instruments should be made and sold. The unfavorable criticisms when intubation was first made public cut him to the heart. They were much of this manner: "The larynx will not tolerate a tube," or "a foreign body; the calibre is too small; it will drop into the trachea; it will become plugged." Medical men had many inspirations concerning the dangers. Strange to say, they all thought the operation easy—anyone could do it. Then came modifications, so-called "improvements." Every green graduate saw improvements at once. These improvements promptly appeared in print, with a cut and the name of the callow youth. Then the instrument-makers made tubes. They made them cheap. Why? It was obvious to them that they could be cast in a solid piece, not made in halves and put together. They smiled in a superior manner at the tilting back of the head; they improved its shape, they took little thought of the retaining-swell, and overlooked

entirely the knobbing of the lower end. Their tubes fitted the larynx much as false teeth would be expected to fit the œsophagus.

Mr. President, and friends who really knew Dr. O'Dwyer, I am speaking for you. Hear me, and witness. What the world knows of this man are his genius as an inventor, his achievement in adding to the equipment of the profession a great operation; he made the most conspicuous real contribution to medical progress within fifty years. That the world knows, that the world has acknowledged. To us there is another and a pleasant duty—to testify that with this genius there was all that goes to make a man. His home life, his religious life, his civic life, his professional relations to colleague and patient, his hospital relations were such as befit a high-principled man. Wherever he moved in the daily routine of life, he left little groups who delight to tell of O'Dwyer, the man. Those of us who were accustomed to go to him for advice, or those who wished simply to be in his presence, for the nameless pleasant influence of his personality, have lost a part of our lives; there is left to us a daily recurring impulse, as to one in a light sleep, to rise up and seek him out. Finally, highly as we here present, all friends of this good and great man, highly as we esteem him as an inventor and genius, highly as we rate him as a practitioner of wide knowledge, much as we valued his superior medical judgment, there is one feature we would place high above this all. We would write upon his monument his achievements, his general knowledge, his medical judgment, but above them all we would write: "O'Dwyer, the Man."

THE DEVELOPMENT OF THE SURGERY OF THE KIDNEY, WITH SOME OF THE LESSONS CONNECTED THEREWITH.

ANNIVERSARY ADDRESS, 1899.

BY LEWIS STEPHEN PILCHER, M.D.

Twenty years ago my interest in the question of the possibility of relieving, by operative measures, certain affections of the kidneys was awakened by a post-mortem specimen of calculous kidney which came into my possession. Attached to the case was a long history of pain, exhaustive suppuration, and lumbar fistula. The possibility of interfering surgically in the case had never been seriously entertained, although in the care of the sufferer up to the time of death most eminent medical talent had been employed. This was in the early part of 1879.

The time was one of expectancy and eager hopefulness in the surgical world, but doubts, questionings, and hesitancy to let go traditional ideas and methods were equally prevalent. For twelve years already Lister had been preaching the gospel of carbolic acid, and for eight years had been smothering imaginary aërial germs with his medicated spray. It was the time when the spray machines were most numerous, and when their odoriferous, melano-uriniferous clouds enveloped every wound and befogged every dressing. In the temple of Æsculapius the incense of carbolic acid was continually arising, nor as yet had even a faint tinge of the odor of iodoform begun to be mixed with it. Mackintosh protective and the eight layers of carbolated resinous gauze, carbolated catgut, and drainage-tubing, and the 1-40 car-

bolic solution, these constituted the ordnance through which surgical victories were to be won.

The value of the antiseptic practice had been proven beyond the possibility of question, but the theory of germ-infection, upon which it was based, had not yet been fully demonstrated. Even so late as December, 1879, in a debate in which many of the leading surgeons of London participated, Mr. Timothy Holmes was able to say that "no convincing proof of the germ-theory, as applied to living tissue and living phenomena, has, as far as I know, yet been offered" (MacCormac, "Antiseptic Surgery," 1880, p. 58). It was not until 1881 that the observations of Ogston, on the relations of micro-organisms to surgical diseases, were published, and not until the publication of the work of Rosenbach, in 1884, and of Passet, in 1885, were the varieties and the natural history of the common micro-organisms of suppuration fully described and their identity established. These had to be preceded by the epoch-making researches of Koch on staining methods and culture media, and it was not until 1881 that his treatise, "*Zur Untersuchung von pathogenen Organismen,*" was published.

General surgeons still confined their operative work mostly to excisions of tumors, osteotomies, lithotomies, amputations, and the opening of abscesses. Some of the bolder had timidly begun to experiment upon the radical cure of non-strangulated herniæ. In this very year of 1879 Macewen was about to do his first operation of this kind, and nine years were yet to elapse before Bassini should report, in March, 1888, to the Congress of Italian Surgeons, his first one hundred cases, a report which, in the light of present knowledge, we see to have finally fully established that most beneficent procedure.

Sands was still cautiously opening perityphlitic abscesses, having up to that date incised in five cases, at periods varying from twelve to twenty-one days after the advent of symp-

toms, for it was not until 1886 that Fitz published his paper on "Perforating Inflammation of the Vermiform Appendix, with Special Reference to its early Diagnosis and Treatment," and not until December, 1899, more than ten years, did McBurney report his first series of operations ("Experience with early Operative Interference in Cases of Disease of the Vermiform Appendix," *New York Medical Journal,* December 21, 1899), and this series included only eight cases. Later in this fruitful year of 1879 Tait was to remove his first pyosalpinx, and to do his first cholecystotomy. These suggestive dates, which crowd upon the memory of many of us who are still engaged in active professional work, are sufficient to indicate the revolution in surgery which has occurred during the twenty years now ending. Old operations have been made safe, many formerly doubtful procedures have become established in legitimate and common practice, and a host of entirely new surgical attempts have been found feasible and useful. A new surgical literature has been created; in this country the scholarly volumes of Gross, of Agnew, and of Ashhurst have been supplanted by newer writings, books published in the tenth decade of the century, but really inspired and made necessary by the achievements of the ninth decade. Surgical papers, formerly diffused through the pages of journals devoted to general medicine, or in hospital or society reports, have now become so important and numerous that in the English as well as in the German, the French, the Russian, the Italian, and the Spanish tongues, a host of periodicals, both monthly and weekly, are devoted exclusively to them.

Since 1879 the problem of surgical effort has been completely transformed; then it was, "How shall the air be purified?" now it is, "How shall the surgeon cleanse his hands?" In place of the spray-producer has arisen the rubber glove; possibly by the end of another decade both will be companions on the same shelf.

In 1879 the magnificent temples of marble and glass which in 1899 have become common, being recognized as essential to supply surroundings most favorable for securing the asepsis of the period, had not yet been planned, nor was their necessity realized until the more complete understanding of the habitats and the natural history of pathogenic micro-organisms had been arrived at. Perhaps even now the last word has not been said as to the arrangement and construction of these buildings. Is there sufficient of advantage in erecting costly structures to contain amphitheatres that will seat from three to five hundred spectators, when the number of those who can get near enough to the patient to realize, much less to see, the details of what is being done in their arenas can scarcely be one-tenth of that number? Are not these theatres the lingering remnants of the days when the spectacular element played a large part in the public work of a surgical teacher? When the profession of a whole nation would gather to see a Syme incise a gluteal aneurism, or the benches of a vast amphitheatre would be crowded by physicians and students to see a Wood work against time in the amputation of a limb or the removal of a stone from the bladder. The surgeon of the closing year of the nineteenth century approaches his work in a different spirit. In his daily work he enters regions and undertakes procedures which Syme or Wood never dreamed of, and he does it with a sense of security from disaster, of certainty of a favorable after-progress, of probable accomplishment of the end sought, never enjoyed by the most eminent of his predecessors. To secure this end there is a co-operation of many hands, of assistants and nurses; there is needed long previous training in technical details, and an exact and tender conscience in the observance of those precautions by means of which the infection of the wound is guarded against. The work in its nature each time approaches that of a demonstration in a laboratory of exact science, and it is in the spirit

of the scientist, rather than of the man who is to make a display of manual dexterity, that the surgeon of to-day does his work. The operating-room is merely a surgical laboratory; its walls and floors cannot be made too smooth and non-absorbent, too much exactness cannot be exercised in removing from it every dust-catching apparatus or pendent fixture; its furnishings cannot be too simple and easily cleansed; glass and marble, polished brass and steel, vitrified tiles, abundant water clear and sterile, the boiling kettle, and the steam-chamber, these have come to stay, at least until possibly a yet more perfect knowledge of the laws by which living cells are governed may point out simpler methods of protecting such cells from the disturbing influence of external causes during the healing process. Meanwhile is it not to be expected that this spirit of scientific precision and of earnest routine work which now characterizes all surgical effort will more and more eliminate the amphitheatrical element from it, and that in the future, even in institutions devoted to teaching, it will become an unthinkable thing that the number of spectators who shall be permitted to gather about an "*opéré*" shall exceed those who are required to assist in the work or who may so closely approach the field of work as to be able to see clear enough the steps which are being taken to derive some benefit therefrom. Out of these conditions which I have hinted at, rather than described, which have made the surgeon a laborious scientist rather than a dexterous actor, developed with steady growth renal surgery, a branch of surgical effort which is surpassed by none other in the degree to which it calls to its aid, for purposes of diagnosis, diverse resources of physical science; in the amount of painstaking, patience, and accuracy demanded throughout every step of its conduct; in the extent to which the observance of the new tenets of surgical technique means success, and their neglect entails disaster; while at the same time, to a notable degree, all its processes lend themselves but little to

the spectacular nor have any reward for the distant onlooker. The development of this branch of surgical effort it is my present task to trace.

The incision of a fluctuating tumor pointing in the loin, possibly of kidney origin, or the dilatation of a lumbar fistula and the extraction from its bottom of a calculus, these constituted the sum total of the efforts at surgical intervention upon the kidneys until the advent of the present generation. As to the removal of a kidney, Rayer, in 1840, in his "Maladies des Reins" (t. iii., p. 240), summed up the wisdom of the ages in the sentence, "It would be folly to attempt such an operation" (*"Ce serait folie de tenter chez l'homme atteint de calculs une telle opération"*). Even the proposal to cut down upon the kidney through healthy overlying planes of tissue, to remove from its interior calculi, or to liberate accumulated pus, had no serious place in surgery. The accounts of the cases of the "free archer of Bagnolet,"* and of Hobson, the English consul at Venice,† of each of whom it was related that under peculiar circumstances a kidney had been cut down upon, stones extracted, and recovery followed, remained simply as *curiosa chirurgica.* They provoked no imitators, and awoke only remarks upon the temerity of the operators and the indefensibleness of such operations.

* An account of his case is given by Mezeray in his "History of France." The date of its occurrence is uncertain, but it was previous to the time of Paré (1510–85). The story goes that this archer was under sentence of death for crime; but at the request of the Faculty of Paris was delivered up to them for experiment, as it was known that he had nephritic trouble. The kidney was cut down upon (so the account goes) and a stone extracted. The patient recovered and lived many years after in good health.—*Dictionnaire des Sciences Médicale*, Paris, 1819, xxxv., Article, "Nephrotomie."

† This case occurred during the last century. A certain Mr. Hobson, English Consul at Venice, having insisted that Dominicus de Marchetti, a famous physician of Padua, should do something to relieve him of his sufferings, that physician cut down as far as the kidney one day, and the next finished by cutting into the kidney and extracting two or three calculi. The patient recovered and lived for years after with a urinary fistula, but with permanent relief from his pain.—*Bernard*, Lond. Philosoph., Trans. xviii., 333.

From the experiences of surgeons dealing with ovarian tumors, however, a suggestion as to possible work upon the kidney finally came. In 1858, Spencer Wells, and in 1862, Thomas Keith began their careers as ovariotomists, and by 1870 the total number of ovariotomies by all operators in Great Britain had already exceeded one thousand. In this country, contemporary with these and working in the same field with equal boldness and success, were Atlee, Kimball, Dunlap, Peaslee, and others. In 1868 Peaslee found, after having removed a supposed solid ovarian tumor, that it was an enlarged kidney that he had taken away. Although peritonitis carried off the patient on the third day thereafter, it was noticed that an adequate urinary secretion was furnished by the remaining kidney up to the time of death.

Wells, too, at about the same time, after the removal of an ovarian cyst, found that he had in addition taken away a healthy kidney, which was inseparably adherent to it. This patient also died on the third day, but no trouble from non-elimination of the urine was experienced. Finally, however, at Heidelberg, was worked out by most careful and rigorously guarded experimentation the physiological fact that but one healthy kidney was required for the excretory needs of the body, and, further, the surgical fact was established that the methodical removal of a kidney from the human subject involved no technical difficulties that could not readily be overcome.

For a year and a half had the life of Margaretha Kleb been made miserable by a ureteral fistula, opening upon the anterior abdominal surface in the scar of a wound made for an ovariotomy, combined with an hysterectomy, in the course of which operation the left ureter had been wounded. In July, 1869, she appealed to Simon, then professor of Surgery in the University of Heidelberg, for relief. The condition that the patient presented satisfied him that relief was to be found only in the suppression of the primary source

from which the urine came. Possibly at the present day an attempt at reimplantation of the ureter into the bladder would first have been made. But it is by no means certain that such a procedure, even had it been successful, would have been the best thing for the patient, for it has occurred to surgeons in these later times to find themselves compelled to finally extirpate for progressive pyelonephritis a kidney whose ureter had been satisfactorily reimplanted in the bladder months before. (See Lange's case, "Annals of Surgery," October, 1899, p. 513.) Whatever criticism may be made, the fact remains that in this instance it was eminently true that "the end crowned the work," for, when at last the kidney was removed, the convalescence was undisturbed, and full restoration to health, comfort, and usefulness followed. It is easy for us, twenty years later, to approach a nephrectomy confidently and unhesitatingly. All its problems have been worked out and demonstrated by the experience of hundreds of cases in the hands of many operators. Not so, however, with Simon at this time. It was absolutely new ground. Would the remaining kidney be competent to the needs of the body? Could the repair of the ligated renal artery, cut off so close to the great arterial conduit, the abdominal aorta, be relied upon to stand the blood-pressure after the absorption of the ligature? Might not emboli become detached from the thrombus in the renal vein, and floating into the general blood-current provoke lesions in distant organs? Could the primary hæmorrhage be kept under control? could wounds and infection of the peritoneum be escaped? And, finally, could the deep and extensive wound-cavity be conducted to a sound healing?

With these questions unsettled was it justifiable to subject a fellow human being to a procedure which involved them all? Not until thirty dogs had been nephrectomized by Simon and his assistants, and it had been demonstrated by the experience gained in these vivisections that in each of

these points surgery was competent to secure safety, did Simon venture to advance to the supreme test upon the human being. *"Was nun aber für den Hund gilt, das scheint mir auch für den Menschen gelten zu müssen?"* ("Chirurgie der Nieren," 1ste Theil, p. 12) are Simon's words in describing this part of his work.

What friend of man and of animals is there who will venture to claim that the subjection of these dogs to these experiments was otherwise than a most humane and praiseworthy act? The advantage to mankind which has proceeded from the sacrifice of these few dogs has been incalculable. Was the act a justifiable one, and is the resort of surgeons and physiologists to similar practices in the pursuit of knowledge or of manipulative skill to be condemned? Ask Margaretha Kleb, or any of the thousands of individuals who, since the publication to the world of the happy outcome of her case, have been relieved of the most atrocious sufferings and imminent death by the invasion of the surgeon's knife into the hitherto forbidden region of the kidney! It is but recently that a gentleman, the picture of health, whom I did not recognize, called upon me, and stated that his object was simply to express to me his sense of grateful obligation and appreciation for service that I had rendered him. When he had recalled himself to my memory, I found that it was a man whom I had seen but once, and that in consultation. Then he was wasted to a skeleton after many weeks' persistence of that complex of rigors and fever and sweating and malnutrition, which speaks to the surgeon so positively of internal suppuration and septic absorption. It had been my good fortune simply, as the result of my examination, to point out a kidney as the seat of this disturbance, and to urge the necessity of its exposure and incision. This had since been done by another hand, and with a result that was marvellous.

It was a veritable resurrection. And what is more rare

than recovery, with returned health there remained a lively appreciation of the guide which had pointed out to him the way to health. But it was to Simon, and to those who followed him in the difficult work of experimental investigation, that he was really indebted. Shall we ask this man, whether thirty dogs is too high a price to pay for thirty years of health and working power for a man?

The "ethics of vivisection" is a term most happily used by a recent writer in the *Edinburgh Review* to characterize the sum of the questions which in these later times have been made to gather around the propriety of subjecting lower animals to pain, maiming, or death for purposes of physiological research or surgical experiment for the benefit of man, for ethics involves not only the consideration of one's moral obligations as to the rights of others, but also of his duty in respect to himself. And what is due to man should receive as full consideration at all times as what is due to the lower orders of animals. All life is sacred, and no one feels this more keenly than the physician, who is of all men the high-priest of life. And yet the order of nature is that life, or the products of life, shall be given to perpetuate life, the lower for the higher, the older for the younger, the mature for the new-born. Is not life everywhere the same, an eternal, indestructible force, dependent for the character of its manifestations upon the quality of the material conditions by which it is environed? When these conditions are such as are no longer responsive to its stimulus, death is said to have occurred, but is there any less of life in the universe? The living cell, the biological molecule that it is, is the unit of life. And whether in the elements of that unit there be potentialities degradingly low or infinitely great, the force with which it is endowed that makes it to attain to all that is possible for it, must be essentially the same in all, and this force is what men call LIFE. But every living cell, be it vegetable or animal, contains within itself the elements of its

own dissolution, sooner or later, and by its dissolution presents materials to be appropriated by other still living cells, and so the same elements anew enter into the cycle of life, and the endless procession of life goes on, immortality as brought to light by science! In this endless chain of transformations that is going on in Nature, instinct, reason, custom, religion, alike, all unite to sanction the use of the lower order of living things for the maintenance of the higher, often, indeed, the very organization of the higher makes it imperative that such should be the case. Every living herb cropped by a grazing animal, every tree cut down for fuel, every animal slain for food, every bleeding victim laid upon a sacrificial altar is an example of this righteous subjection of the lower to the higher forms of life. To use the words of the reviewer already referred to, if medicine is still further "to improve and take its place as a science, it can only be by toiling along the stony and weary path of experimental investigation. Nor need we fear that too many people will press into this path. Human nature is mostly indolent and ease-loving. Research by experiment is difficult and costly, it requires almost infinite patience, infinite hopefulness. It brings in a mere pittance of income; it requires a degree of absorption which prevents any other work being done. There need be no fear of too many people undertaking it." But may not this right to use the lower animals be abused, may not recklessness as to suffering inflicted be displayed by thoughtless or callous experimenters? Doubtless so, but it is far less in amount than the representation of ardent anti-vivisectionists would lead the public to believe, and for its correction an enlightened and sensitive professional sentiment is entirely adequate.

The example of Simon received no imitators for a year and a half, until finally, in March, 1871, Von Bruns, in a case of left lumbar urinary fistula, with pyonephrosis and calculous formation, resulting from a gunshot wound, in the

person of a German officer, extirpated the diseased kidney. Death followed in a few hours, and at the autopsy the remaining kidney was found to be also the seat of multiple abscesses. Five months later, Simon, in August, 1871, for the first time in the history of mankind, removed a kidney on account of calculous disease pure and simple. The patient was a woman, thirty years of age, who for twelve years had been suffering in an extreme degree from the pains and disabilities incident to that condition. A resident of Savannah, Ga., she crossed the Atlantic to put herself under the care of Simon, by whom, on the 8th of August, 1871, the affected kidney was safely removed. In his own account of the operation, Simon confesses that he approached it with very great anxiety. All previous authority had condemned such a procedure in such a condition; never before had it been attempted; not until the operation was happily finished did the apprehension leave him that he might yet find himself confronted by the conditions which his predecessors had described as insurmountable.

For three weeks the convalescence of the patient proceeded without disturbance; she was free from pain, her temperature was normal, the urinary secretion was ample, her appetite was good, the wound cavity had filled up and contracted until it was now insignificant. Simon, however, shared in an unusual degree in that spirit of the older surgeons which prompted them to examine every cavity and feel every surface with their own fingers. They called the practice training their "tactus eruditus." No unfortunate patient could have a cavity opened or a wound made without the by-standing surgeons being invited to put their fingers into it. And the omission to extend such an invitation was a serious breach of professional courtesy. The boldness and enterprise of this Heidelberg surgeon had carried him in this direction further than most sur-

geons. He had passed his hand and forearm through the anal sphincter and along the large intestine until he could feel the kidneys and liver of his patients; he had made a practice of dilating the female urethra with his forefinger and carrying the forefinger into the bladder, and by it had guided a catheter into many a ureter. Where his fingers had been previous to his approach to the bed of his now fully convalescent nephrectomized patient on this, the twenty-first morning after the operation, who can say. It is quite certain, however, that no special precautions to make them aseptic had been taken. The vexed questions as to the relative merits of alcohol and sublimate solution, permanganate and oxalic acid, and chlorinated lime and carbonate of soda, or as to whether the surgeons should wear cotton or rubber gloves, had not yet begun to trouble the surgical mind. So much the worse for this little woman from Georgia and her dreams of future health. As the dressings were being changed in the presence of Simon, the temptation for him to explore the wound cavity with his finger was too much for him, and in it went. He says, in his account of it, that he explored it very carefully with his *little* finger. All the same, within a few hours, the symptoms of general septic infection declared themselves by a chill and a rise of temperature to 103.5° F. (39.4° C.). For some days the battle between the body-cells and the invading micro-organisms continued, until both pleural cavities and the peritoneum were filled with pus, when, on the tenth day, death supervened.

Simon himself died from an aneurism of the thoracic aorta, in August, 1876, without again having occasion to resort to nephrectomy, but the seed which he had sown quickly sprang up and brought forth a most abundant harvest, more particularly when the possibilities which antisepsis opened to the surgical world began to be realized. Up to 1879, when I made a search through litera-

ture for cases bearing upon the one which I have already mentioned as having engaged my interest at that date, I was able to find reports of only fifteen cases of kidney removal, and in more than one-half of these the operator did not know that it was a kidney he was removing when he did it. Six years later the number that Gross (*American Journal of the Medical Sciences*, July, 1885) was able to gather was 233. Since the latter date individual cases have ceased to be counted, the procedure has become as much an established operation of surgery as the amputation of a limb or the relieving of a strangulated hernia, and there are now many individual operators who count their cases of nephrectomy by the score. Simon did more than demonstrate by his vivisections and by his operations upon the human subject that the kidneys were within the range of surgical effort; before his untimely death he had prepared and published two parts of a systematic treatise entitled "Chirurgie der Nieren," the first book of this character in any language. In these were discussed first, the physiological questions involved in such work; then wounds, calculi, suppuration, and hydro- and pyo-nephrosis. For a third part he has reserved cysts, tuberculosis, and movable kidney; but this he did not live to accomplish. It was not until ten years later that other authors began to publish systematic treatises on surgical diseases of the kidney, and then appeared in rapid succession the volumes of Morris, "Surgical Diseases of the Kidneys," 1885, 12mo, 548; Bruce Clark, "Diseases of the Kidney Amenable to Direct Surgical Interference," 1886, 8vo, 176; Newman, "Diseases of the Kidney Amenable to Surgical Treatment," 1888, 8vo, 472; Tuffier, "Etudes experimentales sur la Chirurgie du Rein," 1889, 8vo, 166; Knowsley Thornton, "Surgery of the Kidneys," 1890, 8vo, 102; and finally that of Küster, "Die chirurgischen Krankheiten

der Nieren," I. Hälfte, 1896, 8vo, 274, the first half only of which has as yet appeared.

The two indications for which Simon first performed nephrectomy still remain in the list of the conditions for which the surgeons of the present day resort to it, but with modifications that later experience has introduced. About wounds of the ureter, a considerable special surgery has since that date arisen. While by the various devices of uretero-ureterostomy and of bladder implantation the flow of urine through its natural ureteral channel has been and may be restored in the great number of instances in which wounds of that conduit occur, there still remain certain cases in which neither of these procedures is practicable, or in which it has been neglected until by an ascending infection the kidney itself has become the seat of a suppurative process, while the offensive ureteral fistula persists. Provided the other kidney is known to be sound, the removal of the one whose ureter has been damaged is the proper thing to do. So also in those closely allied cases in which, by obstruction to the ureter, the kidney has been dilated into a huge saclike urinal, which, though emptied by incision, degenerates into a persistent urinary fistula by reason of the continued ureteral obstruction; in these cases, too, what remains of the kidney should be extirpated.

Whether a stone-bearing kidney should be excised or not depends largely upon the condition of the kidney substance itself. Experience has shown that in the earlier period of stone in a kidney, before the kidney has become the subject of pyogenic infection, the organ may be exposed, split open, the stones removed, and sound healing with restitution to a healthy condition follow, in the great majority of the cases in which such a procedure is resorted to. To remove such a kidney, therefore, is not justifiable. Not so,

however, when suppuration has already supervened, and a pyonephrosis as well as a nephrolithiasis has to be dealt with. A possible temporary advantage may be secured even in such cases by an incision of the suppurating kidney, removal of the stone, and drainage, but ultimately in almost all such cases extirpation of the kidney must be done.

The question of the early diagnosis of a renal calculus and of promptness of interference as soon as a diagnosis is made, is thus seen to be of more than ordinary importance. For upon it depends not only the removal of the foreign body with the least amount of risk to the patient, but also the possibility of retaining for the use of the body so important an organ as a kidney.

So also in the case of tuberculosis of the kidney, it is undeniable that the earlier an organ thus affected can be totally removed the better, provided that the disease is limited to the one kidney, and the other kidney is competent as an excreting organ. Excision becomes a serious matter only when deferred until the local conditions have been made difficult of management by inflammatory infiltrations and adhesions and by perirenal suppuration, and the general condition of the patient has been seriously compromised by pain, profuse and long-continued suppuration, and by absorption of retained septic products. The difficulties that attend diagnosis during the earlier period when intervention promises most are many; often the kidneys are involved as a part of a diffuse tuberculosis; often both kidneys are affected, so that little of brilliancy and often much disappointment must attend surgical intervention in this class of cases. The certain march to the grave of an unrelieved tuberculous kidney, the comparatively small risk attending excision of the part or a whole of the kidney that has not yet become the seat of suppuration, in a person whose general health is still fair, makes the

early detection of kidney tuberculosis so important as to warrant resort to explorative incision for the purpose of making a diagnosis whenever such symptoms of renal disturbance as polyuria, frequent urination, transitory recurring hæmaturia, and loin-ache, appear and persist, even though pus has not yet appeared in the urine, and no tumefaction can be felt in the region of the kidney.

Unfortunately, tubercular kidneys rarely come under the surgeon's observation until after they have become the seat of suppurative processes, and the relief of the kidney abscess has become the dominating condition. Incision for the evacuation of pus and drainage must be followed at once or later, according to the judgment of the surgeon in the individual case, by extirpation of the whole tuberculous mass, kidney and all, if recovery is to be secured. The accomplishment of total extirpation in such cases may present the most formidable difficulties by reason of the dense adhesions to surrounding structures that have formed. The immediate mortality rate of intervention in such cases is high, but should have no influence in determining the question of radical operative interference, provided the healthy condition of the remaining kidney has been ascertained. According to the statistics compiled by Bangs, two years ago ("Annals of Surgery," January, 1898), in about one-third of the cases operated upon a lasting recovery has followed the operation, and in an additional equal proportion of cases great improvement was secured for a time. When one considers the nature of the affection, and its rapid course to a lethal termination when left to itself, a procedure which enables the surgeon to cure one-third of the cases, and greatly improve for a time another third, is certainly worthy of all praise. A better record than this can be secured only by earlier diagnosis and more prompt surgical intervention, until that time shall come, not far distanct, one

may hope, when the mastery of tuberculosis through internal therapeusis shall have been achieved.

Pyonephrosis, not associated with calculus nor tuberculosis, naturally calls at first for nephrotomy and drainage. This may be done without reference to the condition of the other kidney, and the earlier it is resorted to, after the symptoms of pus-retention have declared themselves, the greater the probability of retaining the affected viscus as a useful excreting organ, and the less the danger of the secondary involvement of the other kidney. I quite agree with the teaching that it is better to postpone removal till it has been demonstrated, by the lapse of time, that shrinking and final closure of the suppurating cavity will not follow the simple incision and drainage. Before resorting finally to nephrectomy, a full determination of the condition of the other kidney must have been made, and only upon the demonstration of its competency will extirpation of the first one be proceeded with.

In the surgical practice of the present day further indications for nephrectomy are found in certain wounds and in malignant disease. Wounds of the kidney are to be treated just as wounds of any other tissue. The kidney wounded should be exposed and sutured or tamponed with a view to its preservation, if possible. A portion of its substance may be excised, but if it is much lacerated or disorganized, or if the control of bleeding has required the ligation of the renal artery, a complete extirpation of the organ must be made.

Cancers of the kidney present the same problems and respond to extirpation in the same degree as do cancers of other organs of the body. It is often the case that the carcinomatous degeneration begins and extends far without provoking special symptoms to indicate its presence, so that in the case of an internal organ, such as the kidney, by the time when the disease has become recog-

nizable, the period when it was confined within the organ primarily affected and is susceptible of absolute removal has passed by, and the most that a surgeon can do is, by the extirpation of the primary growth, to secure relief from the pains and disabilities incident to its presence in the original location, while the dissemination and advance of the disease elsewhere is progressing to its fatal end. A very large operative mortality rate has thus far attended the efforts at nephrectomy for carcinoma, for the reason that the patients have not presented themselves for operation, or their need for operation has not been realized until the involvement of the perirenal tissues has become so great as to render the enucleation or separation of the mass of gross disease exceedingly difficult and most formidable as an operative procedure, while the resisting power of the patient has become reduced to a minimum. Still, in view of the absolute picture of hopelessness and great present suffering of such cases, attempts to relieve them operatively are eminently justifiable. No more brilliant achievement in surgery has been recorded than the successful efforts of Abbe in the removal of sarcoma of the kidney. In this case a sarcomatous kidney weighing seven pounds was removed from an infant, whose weight after the removal of the tumor was but fifteen pounds. This child is still living, more than seven years later, and is in perfect health. Similar immunity from recurrence, after the removal of kidneys the subject of malignant disease for periods of from three to five years, have been reported by Dönderlein, Israel, and Schmidt.* One such success with its later permanent freedom from recurrence is sufficient to encourage surgeons to continue their attempts to remove cancerous kidneys, notwithstanding the little advantage which in most cases rewards their

* Heresco, "De l'Intervention Chirurgicale dans les Tumeurs Malignes du Rein," Paris, 1899.

labor. Thus much as to the general features merely of only one part of my theme, *viz.*, nephrectomy. But during the twenty years of this brilliant surgical epoch closing the nineteenth century, the conservative surgery of the kidney has been developed to quite as marked a degree as the destructive surgery. All that has been done for the fixation of removable kidneys and the relief of the pain and disability so often attending that condition, dates its beginning from 1881, when Hahn, of Berlin, published his first few cases of lumbar nephropexy.* The opening of an otherwise healthy kidney and the removal from its interior of a calculus, with preservation of the organ, was first done by Morris, of London, in February, 1880.† The possibility of relief of nephralgia, simulating nephrolithiasis, by free division of the capsule of the kidney, with or without incision into the substance itself of the organ, was suggested by Tiffany, of Baltimore, in 1885,‡ and demonstrated by the same surgeon two years later.§ The value of the procedure has been verified by the experience of many other surgeons. Plastic operations on the pelvis of the kidney for the relief of valvular obstruction to the inlet to the ureter, producing intermittent hydronephrosis, is of still later origin, being due to the work of Fenger,‖ of Chicago, and of Mynter,¶ of Buffalo, so late as 1893.

The methods of diagnosis have improved *pari passu* with the extension of operative indications and the perfection of operative technique. Surgeons have learned to better interpret subjective symptoms. Kidney abscesses are less frequently lost sight of under the mistaken cloak

* Hahn, "Die operative Behandlung der beweglichen Niere durch Fixation," Centralblatt fur Chirurgie, 1881, No. 29.

† Morris, British Medical Journal, 1880, ii.

‡ Tiffany, "Transactions American Surgical Association," 1885, p. 134.

§ Tiffany, *Ibid.*, 1887, p. 167.

‖ Fenger, Chicago Medical Record, March, 1893.

¶ Mynter, ANNALS OF SURGERY, December, 1893.

of typhoid or malarial fever; the gastric crises and abdominal distress of a downward dragging kidney are less frequently classified as digestive and neuralgic manifestations, the bleeding and tenderness of a calculous kidney are less frequently referred to intrinsic circulatory disturbances. For the discovery and analysis of objective symptoms, the senses, the arts, and the sciences have all been brought into requisition. Chemistry has lent its test-tubes and reagents, Optics its microscope and reflecting mirrors, Physics its centrifugator, Biology its guinea-pigs and dogs for the injection of suspicious sediment, Bacteriology its plates and incubators, Mechanics its catheters and cystoscopes and segregators, and Electricity its light for the illumination of the hidden outlets of the ureters and for the development of the rays of Röntgen, while, for the preservation of the shadows which these develop, Photography has brought its most sensitive plates. Over and above all these material aids to direct them with eye and hand, and to interpret their results have arisen observers trained, skilful, judicious. The natural result has been an earlier and more correct appreciation of the existence of the conditions calling for surgical interference in so hidden and deep-lying an organ as the kidney, and following upon this a greater degree of success in dealing with them. To this witness the fact that of the 233 cases of nephrectomy collected by Gross, in 1885, in 104 of them death was the result, a mortality rate of nearly 45 per cent.! But the most recent statistics of a great clinic here, in New York, the Roosevelt,* give as the result of the thirty-two nephrectomies done in the period from 1890 to 1898, inclusive, but six deaths,† a mortality rate of less than

* Johnson, ANNALS OF SURGERY, March, 1889, p. 339.

† Of these six deaths three were in cancer cases, a fourth was in the person of a man already nearly moribund through internal bleeding from a ruptured kidney, the fifth was already in a state of desperate prostration from sepsis, and in the sixth case the kidney that was left proved to be already destroyed by disease. (See Johnson's Report, *loc. cit.*)

19 per cent. Even more suggestive as to the possibilities of interference in selected cases are the figures of the Presbyterian Hospital,* where of the seventeen consecutive nephrectomies done in the period from 1893 to 1896, *all* recovered, the mortality rate was zero!

The future extension and most beneficent results of renal surgery depend upon the perfection of the methods of diagnosis, whereby the surgical diseases of the kidneys shall be detected in their earlier stages. Questions of operative technique enter but little into the discussions of the present moment. The trained judgment of the experienced surgeon, with all the resources of the thoroughly furnished clinic at his command, is but little doubted as to location, direction, or extent of his incisions. Having clearly in his mind the condition with which he is dealing, and the work which he is to accomplish, he proceeds straight to his end, exposing quickly and fully the seat of disease, controlling hæmorrhage, limiting shock, avoiding infection, and completes his work thoroughly, influenced as to the details of his procedures more by the particular conditions of the individual case than by the directions of authorities. In renal surgery the matter which most engages the surgeon's thought is the demonstration of the existence of the disease in the particular organ; next comes the question, What is the condition of the other kidney? To the perfection of methods whereby with facility and positiveness these questions can be answered the learning and ingenuity of surgeons may well be given. In this direction to-day lie the remaining problems of the surgery of the kidneys.

* Hawkes, Presbyterian Hospital Report, 1897, p. 234.

ON INFECTION THROUGH THE TONSILS, ESPECIALLY IN CONNECTION WITH ACUTE ARTICULAR RHEUMATISM.

THE WESLEY M. CARPENTER LECTURE, 1899.

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When I was asked by the President of the Academy of Medicine to deliver the Wesley Carpenter lecture, I gave careful thought to the subject that I should select. Since the year 1889, when I was acting as Medical Registrar to the Pennsylvania Hospital, I have been interested in the subject of the close connection existing between the diseases of the tonsils and other, presumably secondary, lesions, and have watched with care the literature bearing upon it. My interest was first excited by noting that in that year among the cases of rheumatism admitted to the wards of the Pennsylvania Hospital a remarkably large number gave a history of sore throat among the early or prodromal symptoms. This was, of course, no new observation, although previously unknown to me. Since that time much has been written upon the subject of the relation of angina to rheumatism, so much, in fact, that I feel my title may seem commonplace. It is, however, this very wealth of material in literature that encourages me to a belief that a review of the work already performed in connection with the subject of the tonsillar infections and the possible infectious origin of rheumatism may be not without interest, even though the

novelty of the subject has been much diminished since I first began to keep track of its literature.

In what follows I shall detail some cases that have come under my observation and discuss the relations existing between various conditions that have been more or less loosely grouped together under the much-abused term "rheumatic."

With the advance in the study of bacteriology, increasing evidence is being brought forward showing the importance of infection in the etiology of many disorders previously supposed either to be idiopathic, to be due to chilling, or to be of metabolic origin. The word infection carries with it the idea of the entrance of organisms into the very tissues of the body, whether through wounds of the surface, through surface tissues pathologically altered, or even through exposed healthy covering of skin and mucous membrane.

The most exposed surface is of course the skin. We therefore find that it is best adapted by its structure to resist invasion, the epidermis being thick and arranged in many layers which are being constantly renewed. The air-passages are probably the second most vulnerable point, and we find protection here effected by the hairy sieve in the nose and by the ciliated cells, which, individually weak, together form an excellent means of expulsion for foreign material that has passed the filter in the nose.

The digestive tract is open to infection, and at its very beginning we find a cavity well adapted to the multiplication of micro-organisms. In the mouth there are constantly present, under conditions favorable to their growth from the presence of pabulum, moisture, and heat, micro-organisms, many of which are either pathogenic or capable of becoming so under favorable conditions. Thus, G. V. Black examined, in 1887, scrapings from the tongue, or some other portion of the mucous membrane of the

mouth, of ten healthy individuals, and found Staphylococcus pyogenes aureus seven times; Staphylococcus pyogenes albus four times, and Streptococcus pyogenes three times. Vignal, in 1886, isolated no less than seventeen species of micro-organisms from his own mouth. These included, among a large number of unidentified forms, such familiar organisms as Staphylococcus pyogenes albus, Staphylococcus pyogenes aureus, Leptothrix buccalis, and bacterium termo. Biondi, in 1887, examined fifty different healthy and diseased individuals, and isolated five different organisms pathogenic to rabbits, guinea-pigs, mice, or dogs, which he named the Bacillus salivarius septicus, the Coccus salivarius septicus, Micrococcus tetragenus, Streptococcus septopyemicus, and Staphylococcus salivarius pyogenes. W. D. Miller, in 1889, found four new pathogenic micro-organisms in association with pyorrhea alveolaris or carious teeth. Podbielskij in fifty individuals with carious teeth found no less than thirty-eight varieties of bacteria. Sternberg gives a list of twenty-three pathogenic micro-organisms found in the mouth, including such well-known forms as Staphylococcus pyogenes albus, Staphylococcus pyogenes aureus, Streptococcus pyogenes, Bacillus diphtheriæ, Bacillus tuberculosis, Friedlander's bacillus, and the Micrococcus pasteuri upon the virulence of which he has done so much work.

Widal and Besançon found streptococci abundantly present in the mouths of twenty healthy individuals, and in those of forty-nine persons suffering from various diseases. They found that the streptococci of the normal mouth never caused erysipelas or septicæmia in animal experiments, while those obtained from ten cases of erysipelas caused either erysipelas or septicæmia in three experiments. An interesting observation, especially in connection with the subject of the protective action of the saliva, was the fact that the streptococci obtained from the mouths

of three patients with variola never occasioned experimental erysipelas, although the organs in this disease were found to contain very virulent streptococci.

With such an array of micro-organisms in the mouth it seems as though there must be constant infection of the mucous membrane. There are in the mouth certain means of protection, such as the constant shedding of the epithelial cells which must carry with them many organisms, and the flushing caused by the saliva, which must carry large numbers to the stomach where the gastric juice can effect their destruction. Sanarelli found that filtered saliva possesses limited germicidal properties, and that if the micro-organisms present do not exceed a certain number they are killed, whereas if they are too numerous, their growth, while at first lessened, is not prevented by saliva. Hugenschmidt, by an interesting series of experiments, proved that the products of growth of micro-organisms in the saliva have a positive chemotactic action, and that this activity protects the mouth from infection through the phagocytosis performed by the leukocytes attracted by these bodies. Albert Mills, in a careful study upon the action of the saliva and the gastric juice, found that the former arrests the growth of most micro-organisms and acts as a germicide chemically, by the toxic action of its salts, and physico-chemically by their bacteriolytic action. Salts of the saliva were found to act less energetically because of the presence of ferments and albuminoid matters which seem to hinder their action, but in spite of this the saliva does attenuate the growth of most microbes, and prepares them for the action of the gastric juice. He also found that the micro-organisms in the saliva in general increase the virulence of imported germs, but that sterilized saliva has no such action.

Midway between, and sharing the dangers of the upper

respiratory and digestive tract, there is an area exposed to great danger of infection—the pharyngeal cavity and the fauces. Without ciliated cells, and being only intermittingly flushed by saliva, there is an area without any of the means of protection possessed by the nose, the mouth, or the bronchial mucous membrane. In this area we have situated peculiar groups of lymphadenoid tissue, forming an almost continuous circle around the entrance to the respiratory and digestive tracts proper, the "ring of Waldeyer." The arrangement of this tissue leaves no doubt either that it serves a useful purpose, or that it is a relic of a formerly useful organ that has survived the process of evolution.

It is of considerable importance to determine exactly what we mean by the tonsils, whether we are to look upon them as collections of recesses and glands belonging to the mucous membrane or as groups of lymphadenoid tissue placed in the submucous tissue. According to Liegéois, among reptiles tonsils exist only in crocodiles, and consist of five or six folds situated on the sides of the pharynx. Nothing is said as to the existence of lymphadenoid tissue in these folds. In birds of prey, according to the same author, there are two large follicles situated upon the orifices of the eustachian tubes. Retterer enumerates eighteen different animals besides man, the evolution of whose tonsils he has studied. In all there is an elevation of the mucous membrane which varies much in its complexity. According to Labbé and Lévi-Sirugue, a rabbit's tonsils consist of two small moulds at the base of the tongue, partly covered by a fold of mucous membrane, while in the guinea-pig they could find no trace of adenoid tissue indicating the existence of that organ. Retterer states that in the bat the tonsils are in the form of simple projecting lips tapering at the end and prolonged by a fold of mucous membrane, while in the mole the same appearance is

present with the addition of small indentations of the surface. From this simple form a quite perfect series of tonsils of increasing complexity of structure can be traced up to the larger mammals. These have tonsils closely resembling those of man in construction.

The tonsils are then evidently not evolutionary vestiges. The peculiarity of the tissues comprising the various tonsils consists not so much in the arrangement of mucous membrane as in the presence beneath the mucous membrane of lymphadenoid tissue such as we see otherwise only in the lymphadenoid tissue of the intestine. If we define an organ from its most clearly differentiated structure, we would say that the tonsils are groups of lymphadenoid tissue covered by a plicated and involuted mucous membrane, and that the latter differed only in extent and arrangement from that present in the neighboring parts.

The exact function of the various tonsils is still a question imperfectly determined. From their structure it is supposed, probably rightly, that one of their functions is the formation of leukocytes. With this property we will concern ourselves but little. The curious arrangements of crypts and plications of the mucous membrane over the tonsils of many animals lends color to the view that from this mucous membrane some useful material must be secreted. It has been supposed by some that one of the chief functions of the tonsils is the furnishing of a lubricating material to facilitate the passage of food through the isthmus of the fauces and the œsophagus. It is possible, too, that the crypts serve the purpose of reservoirs for this lubricating material, and that these are emptied of their accumulated contents by pressure of the fibres of the superior constrictor of the pharynx during the act of swallowing. Such an explanation would apply to the arrangement of mucous membrane as this portion of the throat, but would not account for the presence of

the lymphadenoid tissue lying beneath the surface. It must be remembered that no such lubricating function can be attributed to the pharyngeal tonsils. It would appear, therefore, that some of the function is performed by the curious chain of submucous lymphadenoid tissue composing Waldeyer's ring.

It has also been supposed that the tonsils are placed at the entrance of the respiratory and digestive tracts in order that they may act as guards at those orifices. The acts of swallowing and of inspiration occupy so little time, and such a small portion of the material swallowed and of the air inspired could come in contact with these organs, that it is difficult to see in what way they remove offending materials.

Philipp Stöhr has described a continual exodus of leukocytes from the tonsils into the cavity of the mouth through stomata between the epithelial cells. He considers that the migration is probably not always taking place with equal vigor, and that in a widely open path relatively few leukocytes may be moving, thus leaving a channel for the entrance of infecting material. Ruffer agrees with Stöhr's view, as do other writers upon this subject. Such a migration of leukocytes might be supposed to have three possible objects: 1. The furnishing of lubricating material to the food-bolus. It seems inconceivable that such highly organized cells as leukocytes should in this situation be used to perform an object which is elsewhere performed by cell-products, as, for example, those of the goblet-cells. 2. They might be supposed to be poured out in order that they might act as scavengers upon the surface of the tonsil. 3. They may be supposed to carry to the surface material from the interior of the tonsil, the presence of which within that organ might be detrimental. Martin Hendelsohn, in order to test the significance of the migration of leukocytes, injected emul-

sions of soot and cinnabar into the tonsils, and found that so little of the material was taken up by the leukocytes and carried to the surface that the migration of these bodies could not be considered as a protective action. Goodale has lately shown that in tonsillar inflammation the leukocytes present in greatest number are the mononuclears, the polymorphonuclears being only present in abundance when the peritonsillar tissue became invaded. Labbé and Lévi-Sirugue have more recently arrived at results similar to those of Goodale. Their investigations show that in the reticular tissue of the tonsil there are found typical lymphocytes, a few eosoinophiles (varying in number with the species of animals examined), but no polynuclear leukocytes in the normal tonsil. The lymphocytes being in other situations nonphagocytic, this migration of the leukocytes cannot be looked upon as being mechanically protective, and the reason for the migration is still to be discovered.

The question of absorption through the tonsils is one that has been the subject of numerous inquiries. Studies upon this subject by Hodenpyl, Ruffer, Goodale, Guilland, and Hendelsohn, prove that foreign material, such as carmine, soot, and cinnabar, can be absorbed from the surface and from the crypts of the tonsil within a short time after their application. Statements as to the presence of such foreign material within the leukocytes of the submucous tissues and of the lymphadenoid tissue of the tonsil are somewhat at variance, some authors stating that the leukocytes failed to contain such material employed; others stating that they found such material within polynuclear leukocytes. The question, therefore, of the character of the leukocytes within the tonsil in health and in disease, is one that cannot be said to be definitely settled, although the more recent work with more elaborate methods of staining would tend to prove that the leukocytes

within the tonsils are not of the form which ordinarily in other portions of the body are considered to have phagocytic action.

An important point in regard to the function of the tonsils is the determination of their capacity for absorbing micro-organisms. Lexer has painted the throats of animals with the pus from a case of acute osteomyelitis, and with cultures from the blood of a man dead of general staphylococcic infection. The animals developed osteomyelitis, purulent arthritis, and renal abscesses. On infection of the mouth with highly virulent streptococci, Lexer found that these micro-organisms were present in the crypts of the tonsils one or two hours after infection; that in twenty-four hours after infection threads of micro-organisms often could be seen penetrating partly through the epithelial cells, beneath the epithelium and in the lymph-vessels of the lymphadenoid tissue. In animals living many days after infection no micro-organisms were found in the mucous or submucous tissue, but in the periphery of the adenoid tissue there were small foci of inflammation containing collections of cocci. It is evident, therefore, that previously healthy tonsils cannot only be invaded by, but can soon rid themselves of micro-organisms. Dmochowski has found that in the case of the tubercle-bacillus the micro-organism can pass through the mucous membrane of the healthy tonsil and penetrate into the lymphadenoid tissue of those organs. He found bacilli in the leukocyte paths, described by Stöhr, in some cases without evidence of interference with the epithelium. That micro-organisms are capable of passing through the faucial mucous membrane and the lymphadenoid tissue of the tonsil is shown also by the finding of streptococci in the blood in one case of angina by Buschke, the diplococcus of Fraenkel in the blood of a case of angina with nephritis examined by Baduel, and by Gallois's discovery

of staphylococci in the blood of a case of general infection following nasopharyngeal disease.

The structure of the true tonsillar tissue is essentially similar to that of the lymph-nodes. The function of these lymph-nodes is apparently one of protection. In a most elaborate and convincing article by Manfredi, which has appeared within the past year, it is practically proven that the lymphatic nodules protect the organism in three ways: (1) By filtration; (2) by weakening the virulence of the micro-organisms that reach them, and (3) by the whole organism obtaining a greater or less degree of immunity while the first two processes are in operation. The experiments and reasoning of Manfredi might equally be applied to the tonsils. Such being the case, the tonsils should be looked upon not as a seat of frequent inflammatory trouble, and, therefore, as sources of danger and menace to the organism, but as an extra protective group of lymphadenoid organs placed at a susceptible point, the involvement of which in acute inflammation of the throat is simply an evidence of their activity and of their battle with an infecting agent; precisely as are the lymph-nodules at the angle of the jaw, which probably form a secondary defensive outpost. They should, therefore, not be looked upon as menaces to the organism any more than we should look upon the inguinal lymphatic glands as danger points for venereal infection. To my mind, this is a point which has been somewhat neglected in the general hue and cry against the tonsils. Not that I would claim that enlarged and diseased tonsils should not under proper circumstances be removed. The tonsils probably act as do other lymph-nodules, which were found by Manfredi, in the paper above mentioned, to retain bacteria long after they had disappeared from the other organs. If they fail to destroy the virulence of the organisms which they have filtered out, if they are the seat of organisms still elaborating

poisonous materials, they should be removed, as the only means of getting rid of their bacterial contents. Removal of the tonsils may also be advisable, because only by their excision can we get rid of the susceptible mucous membrane covering and dipping down into them. Of course, also, the question of removal comes up if the organs are so diseased by repeated infection as to no longer perform their function as filters, if they mechanically interfere with proper respiration, or if they are hypertrophied and useless as filters, and at the same time by the recesses and folds of the mucous membrane covering them form resting-places favorable to micro-organismal growth.

The flora of the mucous membrane covering the tonsils is much the same as in that of the mouth. The literature of the bacteriology of the tonsils is so extensive that even a résumé of it would require far too much time. Among the micro-organisms most frequently encountered are streptococci and the various pyogenic staphylococci, while the importance of the diplococcus as a cause of angina has been pointed out, especially by Baduel, Rendu, and Widal and Besançon. The great importance of the streptococcus as a cause of angina is most clearly shown by the examination by Buss of 102 cases, in which that organism was present in all but two of the patients examined. The same preponderance of streptococci has been pointed out also by Veillor and Lemoine.

The term *tonsillitis* is so used that it is almost synonymous with *angina.* While it is convenient to retain the term, I would urge that it be used with the reservation that the part inflamed and responsible for the illness is not in reality the tonsillar tissue proper, but the mucous membrane of the throat at this most exposed situation. The phenomena of acute angina are those of acute toxæmia. With even the slightest form, fever, general malaise, and aching pains throughout the body, are present to a

greater or less degree. The local surface disturbance may not apparently be very great, and inflammation of an area of similar extent in any other portion of the surface of the body would cause by no means such general disturbance, except in the case of a few of the more virulent local infections.

As in other infections, so in tonsillitis we get a variety of secondary lesions, and one of the objects of this paper is to call attention to what I consider a very important subject, although one that is not new.

In May of this year (1899), at the meeting of the Association of American Physicians, I reported five cases of endocarditis following acute angina. As these are reported in detail in the "Transactions of the Association," I shall here merely mention that in three of these cases it was definitely known that the heart was normal before the attack of angina. During the acute attack endocardial murmurs developed; after the attack cardiac signs and symptoms persisted. In the other two cases the previous condition of the heart was not known from personal examination, but there was nothing in the past history pointing to a previous likely etiologic factor or to symptoms referable to the heart, while in both cases the abnormal cardiac signs developed precisely as do those occurring in a first attack of acute articular rheumatism. Since reading the paper referred to I have heard from another patient who left for her home after convalescing from an attack of acute follicular angina, during the course of which a soft, blowing, systolic murmur developed at the apex. I did not mention this case in my paper because it is only lately that I have heard from her physician at home that she still has symptoms and signs of grave organic cardiac disease. Lately I have had still another case under my care in which I suspect endocarditis as a complication of a severe follicular angina (streptococcic),

but I cannot as yet feel certain that the systolic apical murmur which developed during this attack may not be due to her anæmia. My impression is that her mitral-valve leaflets have been damaged.

In addition to the references to reported cases of cardiac disease after tonsillitis given in my previous paper, I would add several others, confirming the idea of the frequency of this disease (or rather this group of infections) in the etiology of endocardial damage. While not a reported case of this association, it is of interest here to note the results of an experimental endocarditis produced by Widal and Basançon through inoculation of a rabbit with streptococci obtained from their own saliva, the valves being previously uninjured.

In 1895 Raoult reported a case of pseudo-membranous streptococcic angina and stomatitis, followed by purpura, pains in various articulations, and endocarditis. The report is rather meagre, especially in regard to the endocarditis, so that it is not claimed that this is certainly an illustrative case. It is spoken of here chiefly because of the fact that endocarditis is mentioned in the title, although but little stress is laid on this feature in the report. Cheadle, in 1896, said, "Endocarditis occurs early in the rheumatic procession of events—not infrequently in the case of children, first of all; before arthritis, although, as a rule, with it or with chorea."

Gustav Singer (on page 277 of his monograph) speaks of four cases of endocarditis arising from angina, one following a tonsillar abscess. Leon d'Astros has reported a cured diphtheria followed by staphylococcic angina, the development of a murmur at the apex and death on the fourth day. Autopsy showed acute mitral valvulitis, and staphylococci in pure culture were obtained from the heart-blood.

Jousset reports a case of angina of two days' duration

followed in a few days by a tired feeling in the limbs and the development of a mitral murmur and pericardial friction. On the following day the mitral murmur became harsher, and the right foot became painful. In this case, therefore, the angina developed first, the cardiac and pericardial lesion second, and the articular manifestations were noted last in the series.

During the present year two articles bearing upon this subject have appeared. In a paper by de Rochemont upon an epidemic of tonsillitis, it is stated that endocarditis occurred in one out of the eighteen cases. Paul Gallois in an interesting article states that in his opinion nasopharyngeal disease is more frequent in the history of young cardiac cases than is rheumatism itself. In eight patients with cardiac disease, only two had had rheumatism and one scarlatinal arthritis. These observations of Gallois are detailed at length by Le Tainturier de la Chapelle in his Paris Thesis of 1897.

The frequency of cardiac disease without history of preceding rheumatism has led me to make careful inquiry as to previous attacks of angina in these cases, and while I have kept no record as to this point and can give no figures, I have been astonished at the number of cardiac cases giving, sometimes voluntarily, sometimes on questioning, a history of one or more attacks of acute and severe sore throat.

In the epidemic of eighteen cases reported by de Rochemont, in addition to the case of endocarditis, there was one of threatened heart failure and one of pericarditis. W. Campbell McDonnel has reported a case of acute tonsillitis followed by pericarditis without endocarditis or arthritis.

Pleuritis as a complication of angina has been frequently observed. In several cases I have met with distinct pleural friction with the subjective signs of pleurisy in cases

of tonsillitis, but have never seen pleurisy with effusion occur in this connection. Hanot, in 1891, reported a case of streptococcic angina, especially involving the pharynx, with pleurisy on the right side coming on eight or nine days after the onset of the illness. In the effusion streptococci were found. The patient died, and the autopsy showed multiple small abscesses in the tonsils, a retropharyngeal abscess, and dissection of the pleura from the thoracic wall with rupture into the pleural cavity, in the contents of which staphylococci were found. In this case it would seem probable that there was direct dissection of the purulent collection from the point of origin to the pleural sac.

B. Auché has reported a case of acute suppurative tonsillitis requiring puncture followed by synovitis of one knee and ankle. Later pleural effusion occurred. Richardiere reported a case of non-suppurating tonsillitis followed by left pleural effusion and later by death from suppuration in the left pectoral region. At autopsy the tonsils were found to be large, but free from collection of pus; there was no peritonsillar, retropharyngeal, or mediastinal abscess, but in the left pleural cavity there was a large collection of pus having no connection with the abscess-cavity in the left pectoral region. Heddaeus has reported a case of angina followed by pleural friction and later pleural effusion and pneumonia.

Huguenin, in an article on cryptogenetic pleurisy, makes the following groups from the point of view of etiology: 1. Those whose port of entry is the tonsils. 2. Those that are primary, which are ascribed to the still unknown poison of acute rheumatism. 3. Those having their cause in a carbuncle or furuncle. 4. Those which can hardly be traced to anything but the colonies of bacilli which are present in the buccal, nasal, and faucial membrane. 5. Those due to trauma. 6. Those associated with pneu-

monia. 7. Those due to chilling. It is thus seen that in two of his classes he incriminates the throat as the primary point of infection, or at least, entrance of the poison. He cites a case of severe lacunar angina followed by double pleurisy with effusion containing Staphylococcus pyogenes aureus. Pestlesohn has also reported a case of angina followed by pleurisy, sepsis, and death.

Last winter I had the opportunity of seeing two cases of streptococcic angina, both in young women, without history of preceding rheumatism in any form, with a quite profuse outcrop of erythema nodosum during the subsidence of the attack. In neither case was there heart-lesion, and in both the erythema promptly subsided shortly after the cessation of the angina. Both cases had somewhat more than the usual amount of malaise and other general symptoms associated with angina.

In 1896 a white woman, aged twenty-six years, was admitted to the Pennsylvania Hospital with sore throat. She had had several previous attacks of tonsillitis, mumps, as a child, influenza followed by pneumonia three years before, and malaria two years before the illness for which she was admitted. After a period of indefinite discomfort and malaise she developed severe sore throat on the day before admission. On examination the whole mucous membrane of the throat was inflamed, the tonsils much swollen, and the peritonsillar tissues were greatly thickened. The urine contained a trace of albumin and pale granular casts. The pain on swallowing ceased in five days and the albumin disappeared before the end of a week. Eleven days after admission there was rise of temperature with a relighting of the tonsillitis and reappearance of albumin and casts in the urine. She complained of pain below both knees, and it was found that on each leg there were from twenty to thirty red and purplish spots slightly elevated above the level of the surrounding skin, indurated

and varying in size from 5 to 2 cm. in diameter. These lesions were very tender on pressure. Later a few new ones appeared, but the skin lesions gradually faded and disappeared nineteen days after the relighting of the tonsillitis. The heart remained normal throughout the attack, and before her discharge the urine ceased to show any abnormal constituents.

Cases of angina accompanied by skin lesions have been reported by Laségue, Boeck and Bull, Loebl, Boeck, Ollivier, Stephanides, Auché, Chaddock, Le Gendre and Claisse, Rocaz, Bourges, Raoult, and Singer. The eruptions can be classed as erythema nodosum in twenty-nine of the cases; purpuric in four; erythema multiforme in two; morbilliform scarlatiniform, urticarial, herpetic, and an indeterminate erythema with desquamation, each, one example. Stephen Mackenzie's paper is of much interest in this connection. It is based on a study of 108 cases of erythema nodosum, in eleven of which, or over 10 per cent., some form of sore throat had preceded the skin eruption, while "rheumatism or rhepmatoid pains" had been the forerunner in 31.4 per cent. In the cases narrated by Singer, he obtained Staphylococcus albus from the blood obtained from the efflorescence. In one of my cases, that will be given in more detail later, there was a profuse urticaria involving all parts of the body, at the same time alternating with hemoglobinuria; both occurrences following upon a severe diffuse erythematous angina.

I have had the opportunity of seeing two illustrations of chorea following upon tonsillitis. The histories of these are, in brief, as follows:

G. A., a white boy, aged ten years, was admitted to the Children's Hospital in September, 1897. There may be found some connection between his illness and the facts that his mother had had nervous prostration and his father was "very nervous and irritable." He never had rheuma-

tism. At the age of six years George had "malaria," followed by what was described as sudden palsy of his left side, with inability to speak. His speech defect lasted one week, and he regained the use of his leg in two, of his arm in three weeks. In two months he had perfectly recovered. The frequency of the statement by the parents that the child is "paralyzed" in chorea, the occurrence of a speech defect with palsy of the left side in a right-handed child, the rapid and complete recovery and subsequent events, all point to this as a mild attack of chorea. After being well for four years, with no recurrence of the nervous symptoms, he was suddenly taken with a severe sore throat, accompanied by deafness. Two weeks after the onset, choreic movements began affecting both sides of his body. These persisted in the neck muscles, and his speech remained jerky. At the apex there was a slight presystolic roughening followed by a short blowing systolic murmur, poorly transmitted for about an inch to the left. He remained in the hospital for about three months, with persistent chorea varying in intensity from time to time.

Repeated cross-examination of the mother could elicit nothing to cast a doubt upon the absence of previous articular pains, the acute onset of the sore throat, and the apparent dependence of the last attack of chorea upon the acute angina.

The other case of chorea following angina is not so clearly established. As it shows, however, several points bearing upon the whole question of the complications of tonsillar trouble, I think it will be well to insert it here.

James R., colored, aged twenty-five, was admitted to the Pennsylvania Hospital on November 27, 1894. He gave a history of small-pox as a child, of tonsillitis in 1891, and of pleurisy in 1892. On the day before admission he suddenly had a rigor and severe pain in the throat. He

had a typical follicular tonsillitis with much swelling of the tonsils, uvula, and pharynx. He improved under the use of salicylate of sodium, but an abscess formed on the right tonsil and required incision. He was discharged cured, but was readmitted on January 12, 1895, having fallen on the preceding evening and struck his left side. Immediately after falling he spat up some blood and that evening had a chill. On examination there was no evidence of trauma and the ribs were sound. Expansion on the left side was diminished. Audible and palpable friction and some impairment of resonance were present in the left axillary region. The next day there were tubular breathing, increased vocal resonance, some crepitant râles, and occasional friction over the dull area in the left axillary region low down. He progressed favorably until five days after the crisis, when the right tonsil became swollen and painful. This improved, but about ten days later acute pharyngitis began. The tonsils became involved and an abscess again formed. This ruptured on February 13, and at the same time his heart's action became very irregular and his general strength much impaired. He continued weak and ill with great irregularity of the pulse, but without further trouble until March 16, when choreic movements began in the arms and head and continued for from two to three weeks. Shortly after they ceased he began to complain of severe pain in the flank, for which Dr. Ashhurst's advice was sought. Fluctuation developed in a few days, and he was removed to the surgical ward upon the supposition that there was a perirenal abscess. The flank was opened by a long incision, but no pus was found, although the tissues were noted to be curiously œdematous. Although no pus was present the operation relieved the pain, and he was finally discharged cured on May 25. Careful inquiry developed

the fact that at the age of eighteen years he had had chorea for four weeks, during three of which he was delirious.

The case is given in some detail because of the association of tonsillitis and chorea, and also because of the possibility of the tonsil being the source of infection, lighting up inflammatory trouble at the seat of his injury, as happened in some of Buschke's cases, which will be referred to later.

The etiology of chorea is still obscure, yet we have a certain number of facts connected with it to give hope of a solution of the question in the future. The close connection of chorea with rheumatism is conceded by practically everyone. The association of angina with rheumatism has long attracted attention. Angina is clearly recognized as an infection; rheumatism is being more and more certainly forced into the infectious group of diseases. A glance, therefore, at some of the work already performed in regard to the possible rôle of infection in the production of chorea will be of advantage.

As long ago as 1880 Leube urged the chemico-infectious origin of chorea. In 1883, C. Max Richter reported a fatal case of chorea. In the blood, obtained from the finger and apparently without the strict precautions that should have been used, he found numerous micrococci. In 1884, Donkin and Hebb performed an autopsy upon a case of chorea insaniens, and they discovered many bacilli in the blood-vessels of the cord. As the autopsy was made thirty-six hours after death and there were already present signs of putrefaction, it is probable that the micro-organisms were due to a post-mortem invasion in spite of their being present almost exclusively in the blood-vessels. Berkley's report upon a case of chorea insaniens is of interest from the point of view of etiology and because of his bacteriologic findings. In a person

previously rheumatic with delirium, during one of the attacks there suddenly occurred jerking movements one week before she was seen. On admission to the Johns Hopkins Hospital there was found to be ulceration of the pharynx with enlargement of the cervical glands. A few days before death parotid swelling appeared. At the autopsy the blood of the left ventricle showed an abundant growth of Staphylococcus pyogenes aureus, the same organism being found in the purulent area of the parotid gland. It would, of course, be improper to attach too great importance to the bacteriology of a case so complicated. Berkley himself thought that the presence of the staphylococcus was simply a coincidence; and although he gives no reason therefor, says that the infecting agent in chorea is probably a bacillus.

Pianese, in 1891, in the medulla oblongata of a choreic, found a special bacillus, slightly motile, spore-bearing, growing well on ordinary culture-media and staining well with carbol-fuchsin. Intraperitoneal and intravenous inoculation of dogs, rabbits, and guinea-pigs gave negative results. After trephining, and subdural inoculation of the bacillus, and after infection through the scarified mucous membrane of the nose, there occurred, as a rule, twenty-four hours after inoculation, irregular movements of the whole muscular system or of certain groups of muscles. In the same year Leredde obtained pure cultures of Staphylococcus albus from blood removed from the thumb of a child admitted with enlarged tonsils and chorea. During its stay in the hospital the child developed a rise in temperature with signs of active endocarditis. Nine days after the acute symptoms subsided no growth could be obtained from the blood.

Triboulet, in 1892, isolated from the blood of a dog with chorea (canine) a large coccus, solitary or in groups, but not in chains. Bouillon-cultures of the coccus were

injected into three other dogs—one with chorea, one a healthy young dog, the other an adult animal. In the first there was no visible effect on the existing movements; in the young dog there was no result except wasting, muscular atrophy and the formation of eschars on the posterior extremities preceding death on the twenty-first day after inoculation. In a paper published the following year, Triboulet pursued his investigations. In a case of chorea with cerebral rheumatism cocci were found in the blood. In one of rheumatism with chorea and pericarditis Staphylococcus albus and aureus were found in the pericardium, but no organisms in the blood or nervous centres. Staphylococci were found in the blood of a case showing abnormal movements after influenza. In one of choreiform movements following erysipelas the blood contained streptococci. In the blood of a patient with tetany following a staphylococcus angina, he found staphylococci. Among five choreic dogs he obtained from the blood: (1) A large coccus of medium vitality; (2) a large coccus in groups, slightly pathogenic and of feeble vitality; (3) a non-pathogenic staphylococcus of minimum vitality; and (4) a streptococcus without vitality. Inoculation of bouillon-cultures into dogs produced late but rapidly progressing muscular atrophy, while injection with sterile bouillon-cultures produced rapid loss of weight. He considers chorea as due to an infection and as a nervous intoxication by microbic poisons.

Rodet and Courmont, in experimenting with soluble products of Staphylococcus pyogenes aureus, found a substance precipitated by alcohol, the injection of which into a dog produced in a few minutes right hemichorea, which soon gave place to generalized contractures.

Guizetti has reported a case of Sydenham's chorea without rheumatism, cardiac signs, or symptoms, which died on the twentieth day of the disease. Cultures were made

from the splenic pulp and blood from the heart, brain, and spinal cord. The three latter gave no growth, but in two tubes inoculated with splenic pulp there grew a capsulated diplococcus in pure culture. In sections of the organs he found no organism except a few short bacilli. He considers that the capsulated organism found in the spleen was due to post-mortem invasion.

Heinrich Meyer studied a fatal case of post-rheumatic chorea in a boy. At the post-mortem he found mitral verrucose endocarditis, hyperæmia of the brain and membranes, and degenerative changes in the heart. Bacteriologic examination showed streptococci of feeble virulence, and Staphylococcus pyogenes citreus, also but slightly virulent, from the blood of the left auricle and of the spleen. Microscopic examination of the brain, spleen, kidney, and liver showed small groups of cocci, staining with Gram's method, lying exclusively in the blood-vessels and chiefly in the capillaries. Blood obtained from the finger in three chorea cases showed no growth.

Apert, in two cases of post-rheumatic chorea, found no growth from the blood of one, and a growth of ovoid diplococci in anaerobic milk resembling the organisms found by Triboulet in acute rheumatism, which will be spoken of later. In his Paris Thesis of 1893, H. Triboulet has made an exhaustive study of the question of the infectious nature of chorea. He concludes from his own clinical, bacteriological, and experimental work, as well as from the scanty literature upon the subject, that the special cause of chorea does not proceed from any specific microbe, but that the disease can depend upon different infectious agents, and that it is important to emphasize the fact that the infection will not have this determination to the nervous system except in persons predisposed thereto.

The uncertain results so far obtained in this line of research is shown by Maragliano in a recent article,

wherein he states that, in eleven reports (some of which could not be verified in the original by me), staphylococci were found in seven, diplococci in two, and bacilli in two cases.

Whether we shall ever have more definite results cannot, of course, be predicted. Certain it is, however, that there is here open a field for study, in the hope of attaining more positive proof for or against the theory of the infectious origin of chorea.

The occurrence of albuminuria with casts in the course of tonsillitis is frequent, as it is in other infectious processes, and A. Fraenkel and Jeanselme both state that chronic nephritis may occur as a result of that illness. The close resemblance existing between angina of ordinary type and scarlatina (angina, skin-eruptions, joint involvement) would suggest the probability of renal damage of permanent character after some cases of the former disease, in view of the frequency of nephritis as a sequel of scarlatina. Laségue, in 1880, reported a case of apparently acute renal congestion, with hæmaturia occurring in a woman, aged thirty-two years, with intense redness of the fauces. Whether this should be considered an ordinary angina is perhaps open to question. Landouzy, in an article on infectious tonsillitis, mentions three cases of albuminuria in the course of sore throat, in one of which he found during life bacteria in the urine, and after death congestion of the kidneys. Nothing is said as to the method of collecting the urine for bacteriologic examination, so that the finding of bacteria has no weight. In the hospital epidemic of tonsillitis, reported by de Rochemont, nephritis occurred in one of his eighteen cases, and Singer refers to a case of acute nephritis following tonsillar abscess. Fernet has put on record a case of tonsillitis with œdema of the feet, beginning the day after the onset, soon followed by abundant epistaxis and hæmorrhoidal

bleeding, vomiting, and oppression. The angina appears to have been contracted from a fellow-worker, who also presented the combination of angina with œdema, as did still a third man engaged in the same work. In the case coming under Fernet's observation there was no other evident cause for the nephritis which was present. Boucsein relates in his paper the case of a boy, who contracted tonsillitis from his mother, but apparently recovered well. Three weeks after his apparent recovery his legs became swollen, he had two convulsions, went into coma, and died. There had been no rash, or other evidence of scarlatina, and there was no reason to suspect the presence of diphtheria. Baduel saw four cases of nephritis following tonsillitis, pneumococci being found in the tonsils and in the blood. In each case a period of malaise and weakness followed the angina before the nephritis appeared. In the urine also he found the diplococcus of Fraenkel. Mannaberg has reported two cases of nephritis occurring in the course of tonsillitis, in both of which he found micrococci in the urine. In his paper there is no evidence as to his having rendered sterile and clean the meatus or the fossa navicularis, or of having taken any of the precautions more recently urged by both Chvostek and Singer as requisite before drawing deductions from bacteriologic examination of the urine in such cases.

Somewhat closely allied to these bases was that of a man, aged thirty-one years, who sent for me on January 17, 1896. He was muscular, but had had frequent illnesses of various kinds. While in fair health he was suddenly attacked by fever, general soreness, occipital headache, pain in the nucha, and sore throat, on the afternoon of the day before my visit. On the morning of my visit he noticed that the urine was of a dark-red color. I

found the mucous membrane of the whole throat very red and œdematous. His temperature was 102.2° F., the pulse 130, the respirations 24. A specimen of urine was obtained on the next day and was found to be of a dark-reddish color, having specific gravity of 1.027 and containing 0.6 per cent. of albumin (Esbach), with many red blood-cells and broad casts deeply stained of a reddish-brown color. On the day after my first visit his temperature had fallen to 101° F., his pulse to 112. The throat looked less red, and his aching had almost disappeared. On January 19 he still had some pain in the back of the neck, his throat looked better, his temperature was 99° F., and he had passed ninety-six ounces of urine in the preceding twenty-four hours, which was found to be smoky, 1.011, and to contain 0.3 per cent. of albumin (Esbach), with many red blood-cells, coarse and fine granular, and many epithelial casts. The urine gradually became more normal in character, so that by January 26 the record of the examination reads: Pale amber, clear, specific gravity 1.008, 0.2 per cent. of albumin (Esbach), no casts found. On the day last mentioned severe urticaria appeared over the whole trunk. The urine had still further improved in character, the albumin having fallen to 0.1 per cent., but a number of hyalin and pale granular casts were present. Within a few days he had a succession of outbreaks of urticaria which alternated with diminution in the amount of urine and the reappearance of blood therein. During all of this period the erythematous and œdematous appearance of the throat persisted in varying degrees in spite of local treatment. Early in February the patient felt better, except for the outcropping of wheals, and went to work in spite of warnings to the contrary. He was not seen by me again, but I heard indirectly that he died within the same year, whether as a

result of the same illness or not I could not discover, as he had moved to another city.

Two interpretations could be put upon the case. It may have been an instance of infectious angina with acute hæmorrhagic nephritis, the latter and the urticaria being due to toxin absorption, or it may have been a case of urticaria of non-infectious origin affecting the skin, the mucous membrane of the throat, and of the kidneys. The latter view would not account so well for the fever and general symptoms. Unfortunately, I either failed to take cultures from the throat or neglected to record the result.

In Le Tainturier de la Chapelle's thesis, to which reference has already been made, there are detailed five cases of nephritis among the subjects of adenoid vegetations or purulent rhinitis. In none of the cases was there any other discoverable cause for the nephritis, and the author considers that in each case it was of infectious origin and due to naso-pharyngeal disease.

Phlebitis following angina has recently been the subject of a paper by Troisier and Decloux apropos of a case of phlebitis of the popliteal vein, occurring ten days after the onset of a streptococcal angina. Similar cases of phlebitis have been described by Trumbull and Vaquez.

Widal says that acute yellow atrophy of the liver is often not primary, but has its point of departure from a tonsillar, bronchial, or uterine lesion. Bearing out the truth of this statement as regards the tonsil, is the report by Babes of a case of fatal jaundice with delirium and abdominal pain occurring in the course of tonsillitis, with putrid plugs in the tonsillar crypts. At autopsy there were extravasations of blood in the internal organs, acute yellow atrophy of the liver, and cloudy swelling of the kidneys. Streptococci in pure culture were obtained from

various organs, the tonsils and lungs showing a mixture with Staphylococcus pyogenes aureus.

Peritonitis occurring in the course of tonsillitis with articular pain is recorded in one case each by Groedel and Froelich, while Apolant details one and mentions two other cases of perityphlitis occurring in the course of follicular angina.

Verneuil has reported two cases of acute hydrocele in the course of tonsillitis, the two lesions disappearing at about the same time. Joal reports four cases of orchitis or ovaritis occurring in the same way, and concludes, probably rightly, that these ought to be classed among the complications of angina, that they are analogous to those which occur in typhoid fever and mumps, that they ought to be attributed to the infectious nature of tonsillitis, and that they are not due to any connection between the organs of generation and the tonsils.

In animal experiments with infection by various microorganisms, muscular atrophy is a frequent result, as was especially pointed out by Roger. Angina may, therefore, be an unsuspected cause of some of the many otherwise unexplainable cases of systemic disease of the spinal cord. According to Widal, atrophy of the muscles occurs days, weeks, or months after the inoculation of animals with streptococci. If animal experimentation is a guide to the effects of streptococcic toxæmia in man, so long an interval may elapse between the infection and the manifestation of toxic action upon the central nervous system, that a primary sore throat might readily be forgotten. A case of progressive muscle atrophy following tonsillitis was shown by Wilson to the Oxford Medical Society, November 8, 1895. In the abstract of the paper the interval elapsing between the angina and the atrophy is not given. Bourget saw convergent strabismus with nasal voice and incomplete paraplegia develop about one month after the

occurrence of a non-diphtheritic angina, apparently due to an infection by a large micrococcus. Gübler briefly mentions the case of a male patient, aged twenty-four years, in whom not only palatine but "generalized" palsy followed an attack of herpetic angina, and quotes from Pery a case of angina followed by "complete paralysis." Palatal palsy is not extremely rare after angina, more frequent after the angina produced by the Klebs-Löffler bacillus than after that produced by other organisms, but whether from toxin absorption or from direct involvement of branches of the palatine nerves, it is difficult in every case to decide.

It is undoubtedly true that the general symptoms present in even the very mild cases of tonsillitis should be looked upon as the result of absorption of toxic or septic material from the part infected. It is rare to have this intoxication reach a very high grade. That it can do so is shown by the case of Tichoutkine, one of staphylococcus infection of the tonsillar crypts with suppuration, in which death resulted, and in the organs there were found such changes as are ordinarily regarded as evidences of septic absorption.

Pyæmia as a result of tonsillitis is unusual, yet that it can occur is shown by Wainwright's case of severe tonsillitis followed by great pain in the forearm, wrist, and thighs, purulent synovitis of the left wrist-joint, phlebitis of the saphena veins, arthritis in the right elbow, and death on the eighth day of illness. Streptococci were found in his blood on the day of death. The case occurred during a house-epidemic.

I have mentioned above a personal case of what appeared to be an early stage of abscess-formation in the perineal region following tonsillar abscess. Lexer records abscess-formation in the left arm and dorsum of the right foot a few days after angina in one case, and in another

an abscess in the ankle with metastatic abscess in the kidneys dependent apparently upon infection by a small abscess in one of the enlarged tonsils. Buss and Virchow have each reported cases of subcutaneous abscess following angina. Buschke has reported four cases in which suppuration apparently depends on the appearance of inflammation of the throat; in one immediately after the appearance of angina suppuration occurred in a previously uncomplicated simple fracture; in another, suppuration occurred in the previously aseptic wound of a plastic operation; in a third, upon the appearance of an angina suppuration occurred in the site of a bruise; while in his fourth case, subperiosteal abscess with osteomyelitis, the portal of entry was apparently the tonsils. In the cases studied by Buschke the bacteriologic examination of the tonsillar crypts of the blood, and of the distant point of suppuration, seemed to clearly prove the causative action of the angina in producing infection. A similar case has been reported by Kocher and Tavel. Buschke says, what it seems must be true, that the lymphatic apparatus (and in this I would include the lymph-adenoid tissue of Waldeyer's ring) is usually an effective filter, but that his cases illustrate its occasional failure. To my mind this is a point of great importance in the whole question of tonsillar infection.

In many diseases the symptoms and signs connected with the throat occupy an important position. Diphtheria is usually a local lesion of the throat produced by a specific agent, and while the Klebs-Löffler bacillus is occasionally found in the organs of fatal cases, it is generally agreed that it remains a local infection with general symptoms of greater or less gravity due to toxin-absorption. I would offer the suggestion that the well-recognized gravity of nasal diphtheria, except when it occurs in what we may call the less acute form of membranous rhinitis, may be

due to the infection taking place at a point without special development of submucous lymphadenoid tissue. In scarlatina the symptoms and signs connected with the throat are so prominent that the mucous membrane of that point has been suspected of being the point of entry of the infecting agent. Whether we should hold this view or consider the erythema of the throat as due to an effort of the mucous membrane to eliminate toxins, or to a vasomotor disturbance produced by the absorption of toxins analogous to atropin, cannot as yet be considered definitely proved. Possibly the certain demonstration of the cause of scarlatina, and the definite knowledge of its biologic characters, may throw some light upon the question.

In one other disease the condition of the throat is an important feature. I refer to acute articular rheumatism. The frequency of angina preceding rheumatism has been noticed by almost all writers upon the disease, and, it may be remembered, was the cause of my first becoming interested in this subject. Observers differ much in regard to the frequency of throat affections as a prodome of rheumatism, owing, I believe, in some measure, at least, to the fact that the angina is frequently so mild as to be forgotten by the patient, and that the examination of the throat may reveal but slight evidence of disease. In many of the fatal cases of rheumatism that are reported the tonsils reveal evidences of abnormality only upon section after death. In addition to this, it is to be remembered that the so-called third tonsil may be the site of lacunar inflammation independently of the more readily examined faucial tonsils, a fact that was pointed out by de Haviland Hall. The statements as to the percentage of preceding tonsillitis in relation to rheumatism vary from 4 per cent. (Stoll's estimate in 572 cases) up to 30 per cent. (the proportion named by Kingston Fowler).

Auclair states that it is rarely absent. Stewart gives the proportion as from 70 to 80 per cent.; Singer 42 per cent.; Kühnau 27 per cent.; Gerhardt 21 per cent.; Groedel at about 5 per cent., while Stoll, as stated above, allows but 4 per cent. In the cases tabulated by me in 1889 the proportion was a little over 70 per cent. This number includes only cases giving a history of prodromal angina or having visible evidence of disturbance in the fauces.

Few observations have been made upon the bacteriology of the throat in rheumatism. In the few fatal cases wherein the tonsils were examined after death streptococci and staphylococci have been found.

Acute polyarthritis with cardiac lesions has been seen to succeed the following lesions so closely as to give rise to the belief that the former was the effect of the latter. These lesions or events apparently giving portal of entry are a wound of the foot (Sacaze); operation for ingrowing toe-nail (Pribram); vaccination (Block); epistaxis (Gallois); gum-boil (Reinhard); phlegmon (Singer); otitis media (Sacaze and Wolff); dysentery (Quinquand); and bronchiectasis (Gerhardt). While it is questioned by some whether these cases should be classed as acute articular rheumatism or should be relegated to the class of pseudo-rheumatisms, I do not believe that, simply because they followed upon a gross breach of surface, we should look upon them as pseudo-rheumatisms. The same distinctions were made at one time in regard to traumatic and idiopathic erysipelas, the latter of which is now known not to exist.

The nature of acute articular rheumatism has always been a subject of interest. For some years there has been a steadily growing tendency to class it with the well-recognized acute infections. Much confusion has resulted from the improper use of the term "rheumatism." In the remarks that follow I refer only to true, frank, acute

articular rheumatism. The cases of subacute and chronic synovitis, often called rheumatic, fall into an entirely different class, and should be left out of consideration in any discussion upon the disease. A more confusing element in the question is the occurrence of polyarthritis after or in the course of such diseases as scarlatina, erysipelas, typhoid fever, pneumonia, and gonorrhœa. This question will be touched upon later.

One of the criterions by which we judge of the presence or absence of infectious character in the case of any disease is its occurrence in epidemics. While such occurrence is a strong point in favor of the infectious character of a disease, it is not requisite to prove its nature. For example, it cannot be denied that a dissecting wound is an infection, yet it is of course a disease of an individual. Nevertheless, if epidemicity, even though only rarely, characterizes a disease, we can safely say that there is strong reason for concluding that it owes its origin to infection. Direct transmission of a disease is still more certain proof of its infectious nature.

In regard to the latter point there are on record two oft-quoted instances pointing clearly to direct transmission of rheumatism. I refer to the cases reported by Pocock and by Schaeffer. The former case relates to a woman in the last month of pregnancy, who was attacked by rheumatism. Thirty hours after its onset she was delivered. The child seemed healthy at birth, but twelve hours later became feverish, and redness and pain in the right shoulder and elbow developed. The symptoms and signs in both mother and child were relieved by the administration of sodium salicylate. Schaeffer's case was a woman pregnant with her fifth child, who developed fever with pain in the ankles and hands. On the fifth day of the attack she was delivered of a healthy child. When the child was three days old it developed slight swelling of the dorsum

of both feet, of the left ankle, and of one phalangeal joint.

The epidemiology of rheumatism has lately been most thoroughly discussed by Newsholme. He has shown that rheumatism occurs with waves of intensity in different countries, the period of minimum and maximum prevalence being quite like those noted in the well-recognized infectious and contagious diseases. Many localized epidemics are recorded in the literature, one of the most striking being that observed by Fiessinger. Mantle has also related a very marked instance. The possibility of local causes for such outbreaks, defective drains, dampness of the cellar, and other causes frequently supposed to account for some cases of rheumatism, might be capable of explaining some of these outbreaks, although the etiologic relation of these factors in the production of acute articular rheumatism is not proved.

In spite of the large amount of work performed in order to discover a microbic cause for acute articular rheumatism, so far definite proof as to the existence of a specific micro-organism has not been furnished. The same is true of scarlatina, of measles, of variola, in fact, of many of the diseases universally recognized as infectious. The difficulty in interpreting the results of bacteriologic study has been much increased by our uncertainty in regard to the dividing line between true acute articular rheumatism and arthritis secondary to local lesions and to the typical infectious diseases, such as scarlatina and gonorrhœa. A good example of the possible fallacy in drawing conclusions in regard to bacteriologic findings in rheumatism is afforded by the case reported by Guttmann in 1886. In this case a fourteen-year-old boy developed acute pain in the thigh. Five days later pain was complained of in the knee of the same side. On the eighth day pericarditis with effusion was found. At autopsy

Staphylococcus pyogenes aureus was obtained in pure culture from the exudate in the pericardium and in that of the knee-joint. In addition there were found purulent foci in the kidneys and in the muscles of the left chest. It is hardly proper to look upon this as a case of acute articular rheumatism. Rather we should suspect it of being osteomyelitis of the femur, with consecutive joint-involvement and pyæmia. So also in the case reported by Babes in 1883, there is doubt thrown upon the propriety of calling it an example of acute articular rheumatism, because of the presence of a "metastatic abscess," a lesion that may have been simply coincidental, but is not a part of the typical picture of acute articular rheumatism.

There are, however, several reports of bacteriologic examination in which this doubt cannot be entertained.

Mantle, in 1887, reported the case of a man with typical acute articular rheumatism, from whose knee-joint he aspirated fluid which contained micrococci and small bacilli, and in whose blood were found micrococci single or in pairs. Mantle says further that in each of sixteen cases he found bacteria in the blood.

Popow, in the same year, made cultural examination of a case of acute rheumatism, and obtained a citron-yellow growth of cocci, single or in chains, and larger than the cocci found in erysipelas. Injection of the organisms into the jugular vein of two rabbits caused "acute articular rheumatism with pericarditis and endocarditis." I have been unable to obtain the original of Popow's article, and in the abstracts obtainable no statement is made to show how nearly the rheumatism resembled true acute articular rheumatism in the human being. If the resemblance was close this experiment is unique.

Buday, in 1890, found the Streptococcus pyogenes in the brownish-yellow bloody contents of the shoulder-joint of a woman with polyarthritis of some weeks' duration.

In a series of interesting experiments with inoculations of staphylococci and streptococci in animals, he reached some interesting conclusions regarding joint-infection, but as they have little to do with our subject I shall not discuss them.

In the same year G. Lyon found diplococci and streptococci in the articular fluid, pleural effusion, and blood from the heart of a person dying in the acute stage of acute rheumatism. He also found by culture a streptococcus in the blood from the finger and in the urine of two other cases.

Bouchard and Charrin, in 1891, in the articular cavities, or in the surrounding structures of cases with acute rheumatism, found Staphylococcus albus six times, Staphylococcus albus and aureus once, Staphylococcus albus with Staphylococcus aureus and a short bacillus once, Staphylococcus aureus with a bacillus once, and in two cases no micro-organisms.

Since 1891 several important communications upon this subject have been made by Achalme and others bearing upon the presence of a bacillus in the blood in acute articular rheumatism. It grows anærobically, is slightly smaller than the bacillus of anthrax, and forms a peculiar odor. Two interesting features in its life-history are the facts that its growth is facilitated by lactic acid, and is retarded or prevented by small quantities of sodium salicylate. Achalme's bacillus has been found also by Thiroloix, Carriere, and Rosenthal.

Triboulet, Coyon, and Zadoc found Achalme's bacillus in two out of six cases. They lay stress upon the fact that both of these cases were complicated. In eleven consecutive cases of acute articular rheumatism of varying degrees of severity they found a diplococcus constantly present in the blood. This diplococcus, when injected into animals, caused mitral valvulitis, the mitral leaflets

being found to contain the organism. They claim that Achalme's bacillus is only present in complicated cases and never in ordinary uncomplicated acute articular rheumatism.

Riva adopted the ingenious plan of using as culture media synovial fluid alone, synovial fluid added to more ordinary media, and sterile synovial fluid obtained from the injured joint of a horse. By these means he obtained a growth of peculiar large, roundish bodies, later giving place to bacilli, whereas in the ordinary media no growth occurred. So far as I can find, his results have not been confirmed.

For some time Singer has been carrying on systematic investigations upon the blood, articular fluid, and urine in cases of acute articular rheumatism coming under his care. He has examined the blood of sixty cases of rheumatism and got a positive result in nine cases (15 per cent.). Among these sixty cases eighty-eight examinations were made. The Staphylococcus pyogenes albus was found nine times; Staphylococcus pyogenes aureus with Staphylococcus cereus albus once, Streptococcus pyogenes once, and Streptococcus conglomeratus once. Examination of the joints were made thirty-one times in twenty-one cases, with four positive results, only two of which were manifestly cultures of growths that undoubtedly came from the joint-cavity. Examination of the urine was made in eighty-five cases, of which forty-nine gave a positive result. Among these Staphylococcus pyogenes albus occurred alone in twenty-four cases, combined with other staphylococci in eight cases. Staphylococcus aureus occurred alone in two, streptococci alone in eight, and combined with staphylococci in five, while Bacterium coli was found in two.

Chvostek has made a similar series of examinations in nineteen cases. The blood was examined in sixteen and

always found to be sterile; in seventeen cases the articular fluid was examined and found to contain micro-organisms but once (bacilli in small number), while out of fifteen whose urine was examined he found no growth from ten, while Staphylococcus albus, Bacterium coli, a large, plump coccus, and Diplococcus ureæ were each found in one case.

Chvostek and Kraus, in a monograph published last year, have pursued the subject further, and criticised the work of Singer. They claim that, in a large number of different infections, bacteria are found in the urine, without reference to the nature of the disease. In malaria, a disease with a known and distinctive causative factor, and during the fever produced by tuberculin, they found staphylococci in the urine. They also cast doubt upon the efficacy of his cleansing of the urinary passages, as the urethra is apt to contain micro-organisms beyond the fossa navicularis. In regard to Singer's discovery of organisms in the blood, they cite the negative result, in ninety-eight cases obtained by themselves, by Jez, by Michaelis, and Kühnau. In regard to the cases examined by Singer, they criticise the diagnosis of several, looking upon many of them as conditions other than acute articular rheumatism. They thus reduce the proportion of cases in which positive results were obtained from the blood to 8.2 per cent., instead of 15 per cent., the proportion claimed by Singer, and think that others were examples of mixed infection, while still other apparently positive results were due to contamination.

Kühnau, in sixty-seven cases of articular rheumatism, only once found staphylococci in the blood, while all of the others, including eighteen, in which lacunar or phlegmonous angina had accompanied the disease, he found no pathogenic organisms, except in a few cases considered by him to be due to accidental contamination.

To still further offset the positive investigations that

have been made, we have a large number of reports in literature, showing the absence of organisms from the articular contents. Among these I would particularly mention the statements of Saint Germain, of Leyden, and of Sahli. In spite of this absence of positive findings, in many cases we must, before despairing of the finding of more definite results, bear in mind that new culture media are being constantly devised, and new stains or combinations of stains employed. Possibly, with the further development of bacteriology we may find that there are constantly present micro-organisms that elude our present methods employed for their detection. Singer's discovery of micro-organisms in the urine still requires confirmation, and its significance cannot be rightly estimated at the present time.

Definite and unassailable proof of the presence of a causative agent in the blood is not necessary to the theory of the infectious origin of rheumatism. Such proof is not present in the case of scarlatina, measles, or variola, well-known infections.

The sterility of the articular fluid may be explained in various ways, and does not invalidate the theory of the infectious origin of rheumatism. While it cannot be gainsaid that specially devised culture media and the employment of new stains may reveal a specific cause in the synovia, such development need not be awaited before classing rheumatism among the infections. Fraenkel says that the majority of all sero-fibrinous effusions into the pleural cavity are free from bacteria, especially when they occur in those previously healthy; and that, except in the case of tuberculous pleurisy, the effusion only contains micro-organisms if the pleurisy be embolic and the emboli carry germs, if bacteria are found in the blood, or if the pleurisy be secondary to a neighboring bacterial inflammatory process carried to the pleura by the lymph-paths.

Goldscheider also, among others, has demonstrated the frequent absence of micro-organisms from pleural effusions. Even in gonorrhœal arthritis, Singer found the articular liquid sterile in four cases. Buday holds that micro-organisms reach the joint cavity only if the synovial membrane is the seat of metastatic abscess, necrosis, or hæmorrhage. Saint Germain says that the infectious joint-inflammations arise from two distinct processes according to the organism causing them. Some result from a local direct action of the pathogenic microbes upon the synovial membrane, in which case they are found in the synovial effusions; others are produced indirectly (at a distance, so to speak) by microbes, which only penetrate the articular cavities when the organism, overcome by the infection, has no more power to resist them.

As Chvostek clearly puts this question, the absence of bacteria in the joints might be explained in one of three ways:

1. The micro-organisms might be in the membranes of the joints and not enter the cavity. This explanation is not admissible, because the blood-vessels of the synovial membrane are easily penetrated by bacteria, and there is no reason for their absence from the cavity when the exudate contains cells derived from the membrane. Examinations of the blood and of the fluid from the œdematous tissues, aspirated from the neighborhood of the inflamed joints, gave no result.

2. The micro-organisms might be dead within the joint, but in this case, while cultures would be negative, direct examination ought to discover them.

3. The synovia might exert a bactericidal influence; but this explanation cannot hold, inasmuch as synovial fluid is a good culture medium for many micro-organisms.

His fourth explanation is the one that he himself advocated, as early as 1895. It is that the articular mani-

festations are due not to the action of bacteria directly upon the joint lining, but to the action of toxins. The same theory was advocated by Triboulet in 1892, and by Saint Germain in 1893, and later by Gerhardt.

This view would explain the sterility of the joint-contents, and the many negative examinations of the blood for micro-organisms, while it is not inconsistent with the theory of the production of the disease by the bacillus of Achalme, by the diplococcus of Triboulet, or by the other bacteria that have been found in the blood in this disease and have been supposed to be a possible causative factor in its production. At the same time, it might explain the occurrence of rheumatism in the newly born as described by Pocock and by Schaeffer.

This theory of the production of the polyarthritis of rheumatism by the actions of toxins receives support from the articular pains frequently noted after the subcutaneous injection of antitoxin for diphtheria. Of course, the analogy between the action of the direct products of a micro-organism and that of a substance manufactured by the animal economy to overcome a bacterial poison, is one that is not by any means strict. However, another phenomenon noticed after these injections is so common a member of the rheumatic series that its occurrence cannot fail to impress one as being significant. I refer to the skin lesions present after the use of diphtheria-antitoxin. These superficial evidences of the action of the serum containing antitoxin take the forms of a simple erythema, erytheme multiforme, erythema nodosum, and purpura, all of them forms that are associated with rheumatism. That the eruption is not due to the antitoxin contained in the preparation, but to the serum itself, has been recently pointed out by Berg and by Michael. The former states that the eruptions appear after the injection of serum from a non-immunized horse, while Michael has shown that the

exanthem produced by the injection is probably due to the blood-serum, inasmuch as it appeared relatively less frequently after the use of the more concentrated solutions of antitoxin than after the employment of larger doses of lower immunizing power. A possible explanation of the articular manifestations of rheumatism would be the manufacture of antitoxin by the individual in excess of that required to counteract the toxin produced by the infecting agent. Were this found to be the case the analogy with the action of diphtheria-antitoxin upon the joints would hold with greater force.

As illustrations of the effect of diphtheria-antitoxin in producing phenomena closely simulating rheumatism, I would quote two cases from literature: Auerbach reports the case of a woman with diphtheric angina of medium severity. On the second day she received 1,000 units of antitoxin. Four days after the injection there appeared in the evening a rise of temperature with typical erythema exudativum on both feet, with much œdema and pain in the ankles. On the next day the eruption was more widespread, and the painful swelling of the small joints of the feet, of the knees, and hips appeared. These manifestations continued for about three weeks after the injection. Suddenly, on the twenty-fourth day, periosteal swellings appeared and continued for a week. It is a question in this case whether the "rheumatic" manifestations may not have been due to toxin absorption from the throat (probably due to the presence of organisms other than the Klebs-Löffler bacillus rather than to the single dose of antitoxin).

Dickinson reported a case of acute rheumatism ushered in by symptoms resembling influenza. While thoroughly convalescing from this affection the patient contracted faucial diphtheria. Antitoxin was given, and two days later signs of pericarditis and mitral regurgitation de-

veloped. In the account in this case the close connection between the injection of antitoxin and the sudden onset of cardiac lesions with profuse acid perspiration strongly suggest the likelihood of the occurrence being due to an accession of "rheumatic" manifestations directly caused by the remedy. In answer to a letter of inquiry, Dr. William B. Coley writes me that he has not seen articular or cutaneous manifestations in connection with the use of erysipelas toxins in the treatment of malignant growths, but that in his earlier work, when he used living cultures, he did observe articular swelling and pain in a few instances; and that in 1895, in experimenting with the erysipelas serum (made by treating a horse with the toxins for several weeks) he noted urticaria and articular pains.

There are several points of resemblance between ordinary septicæmia, a disease that is due to toxin absorption, and acute articular rheumatism. The fever-curve, the eruptions common to both diseases, and the joint-manifestations all cause us to feel that there must be some connection between the two.

The view that articular rheumatism is a modified pyæmia has much that is attractive. The irregular fever, the free sweating, the frequent occurrence of sudamina and erythematous lesions of the skin, all point to a resemblance between the two. It has been found by Courmont that the attenuated infections have a remarkable tendency to localization upon the joints. In this may be found an explanation of the greater relative frequency with which the joints are attacked in the course of angina as compared with lesions of points other than the throat; for it is not unreasonable to suppose that the organisms in the throat may be virulent upon their lodgment, but may become attenuated either by the action of the saliva which passes over them, or by the fact that immediately after they penetrate the mucous membrane they or their toxins

are brought within the influence of the attenuating lymphadenoid tissue of the tonsils.

Again, as has been frequently urged, rheumatism may be a symptom-complex produced by a variety of micro-organisms, and not an infection by any one organism. This view has much to support it.

I have shown above that following angina we may have a series of accidents resembling those seen in acute articular rheumatism—aching pains, marked general depression, erythematous skin-lesions, endocarditis, pericarditis, and chorea. In many books we find the statement that the order of appearance of the various rheumatic manifestations can be indefinitely varied; that the endocarditis may precede the arthritis; and that erythema nodosum may be the first lesion noticed, other members of the rheumatic series following later, while Wilks has reported a case of chorea directly preceding rheumatism. In such cases these accidents, so to speak, are frequently spoken of as being rheumatic. I question decidedly the propriety of such a view, nor does the result of treatment by anti-rheumatic remedies at all prove the affinity of a particular lesion to the rheumatic group. If rheumatism is frequently preceded by various throat inflammations, if any of the ordinary complications of rheumatism which in reality make a part of the disease can occur without joint-manifestations and following tonsillitis, it would seem far more rational to look upon all of these conditions as the result of infection taking place from the entrance of micro-organisms or their toxins by way of the tonsils or other portal of entry. If this view be correct, it would be more proper not to speak of rheumatic angina, but to reverse the order and look upon the angina as the cause of rheumatism and upon the various manifestations following the angina as the result thereof, and not as being due with the angina to some unknown indefinite, rheumatic poison.

I would sum up in the following statements the arguments that I have endeavored to use and to state my train of thought more concisely than was possible in the body of a paper covering such a wide field.

1. The tonsils are active and useful organs whose function it is to offer a barrier to the entrance of organisms into the deeper tissues at a point which by its location and construction is very open to infection.

2. The tonsils act in this respect as do other lymphadenoid tissues in the body, as is best exemplified by lymphatic glands.

3. That during the course of or following tonsillitis we may have occurring most of the important complications of typical acute articular rheumatism.

4. That acute articular rheumatism is an infectious disease, dependent possibly upon no one organism, but upon a variety of bacteria.

5. That the phenomena of rheumatism can be accounted for by toxin absorption.

6. That the toxin causing rheumatism may be produced by an attenuated micro-organism.

7. That it is possible that the frequent entrance of the micro-organism by way of the throat may explain the fact that we have acute articular rheumatism developing after an invasion of the throat rather than the ordinary septicæmia or pyæmia, for the reason that just beyond the port of entry there is situated a collection of lymphadenoid tissue capable of restraining the growth and virulence of micro-organisms attacking the membrane which it protects.

8. That the terms rheumatic pleurisy, rheumatic purpura, rheumatic erythema, and rheumatic sore throat should be used with less freedom, and that it would be more correct to look upon them as the result of infection, whether accompanied or not by articular phenomena,

rather than as latent, aborted or incomplete forms of a condition produced by an unknown, mysterious, and intangible rheumatic poison.

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CONJUGATION IN THE ASEXUAL CYCLE OF THE TERTIAN MALARIAL PARASITE.

THE WESLEY M. CARPENTER LECTURE, 1900.

BY JAMES EWING, A.M., M.D.

In 1897 the writer's attention was attracted by a specimen of blood from a rich tertian infection in which there were very numerous twinned parasites of about twelve hours' development, while all the older parasites were single. A remarkable specimen of this type was secured at Montauk, in 1898, from a soldier just arrived from Cuba, in whose blood there were two very compact and very numerous broods, nearly all the young parasites being twinned while all the older forms were single. Extreme length and variety of amœboid processes characterized the younger parasites in both cases. The latter case promptly raised a suspicion that under some conditions young tertian twins might conjugate, producing a single large full-grown parasite.

In the following spring, two pronounced cases of the same type were observed in New York. In one of these the writer was able to follow the parasites through one complete cycle, and found that the young twins were succeeded by single full-grown parasite. At the same time, by the application of the Nocht-Romanowsky method of staining the parasites, all stages of the gradual union of nuclei were clearly demonstrable, and the writer's suspicion regarding a possible conjugation of young parasites reached a positive conviction.

Since that time other cases have been observed which have supported the conclusions reached in 1899, and presented in a preliminary report at Baltimore in March, 1900.

The evidence favoring the belief in conjugation of parasites consists principally in the morphological appearance of twinned organisms in their developmental stages. The blood in typical cases usually shows two broods, the younger consisting of twinned compact and ring-shaped parasites, and the older of single large or full-grown parasites. In many instances the young organisms are entirely separate, each exhibiting a single large granule of chromatin. Many red cells, however, contain two young parasites which are clearly fused together along one segment of their bodies, and two large chromatin granules are then invariably found at distant points in the parasites.

The fused bodies usually differ in appearance. One is then a large, delicate ring with thin bow and chromatin granule of moderate size, while the other is a coarser body, often compact, or, if ring-shaped, exhibiting a thicker bow, inclosing little or no hæmoglobin, and presenting a larger chromatin granule. These differences between the conjugating parasites are not always clearly visible.

Among the rings which occur singly in such specimens of blood, the two forms of young parasites are often distinguishable, but the writer has been unable to find recorded any observation of single rings containing two large and equal chromatin granules. Every red cell containing two large and equal chromatin granules always contains two distinct young parasites.

It appears, therefore, that the bodies of these young twinned parasites become fused together while their nuclei remain separate. Occasionally the two chromatin granules are found close together, but no signs of fusion of nuclei are found at this early stage.

In a somewhat later stage of development most of the parasites are found to have lost the simple ring-form and to have developed a number of long, beaded, thread-like pseudopodia, variously curled in the red cells, indicating a

very active amœboid stage. The chromatin masses are now subdivided into ten or twelve granules, but these masses still remain far apart and show no tendency to unite.

In still later stages the amœboid figures become less marked and the masses of chromatin lie side by side united by a little achromatic "milky" substance. Finally, the groups of chromatin granules come to lie side by side surrounded by achromatic substance, and this phase is marked by a distinct reduction in the length of amœboid figures. Beyond this stage the parasites show complete fusion of both bodies and nuclei, the resulting individual being of large size and showing an abundance of chromatin.

The morphological evidence indicating conjugation is therefore apparently complete.

There is also the strong circumstantial proof to be mentioned that very numerous young twinned parasites are succeeded by older single forms, and equally significant is it that a full-grown brood, all single, is found associated with a numerous young brood mostly twinned. It is not at all likely that twinning can occur extensively in a part of a brood and not at all in its older members, or in one brood extensively and not at all in its predecessor. The occurrence in the Montauk patient of two broods, one less than half grown and almost invariably twinned and the other approaching segmentation and all single, convinced the writer at once that conjugation was the only possible explanation applicable to the case.

Some possible objections to the theory of conjugation must be considered.

The suggestion naturally arises that the presence of two masses of chromatin does not necessarily mean the presence of two parasites in one red cell. From a long series of observations on the character of the chromatin in young tertian parasites, the writer must admit that this claim is partially valid. The young tertian parasite, in some cases, may con-

tain two granules of chromatin. In the young compact body previously described, these granules, when present, may be large and of nearly equal size, but in the delicate tertian ring the writer has never seen two equally large chromatin granules. In somewhat rare instances the thin ring shows an accessory granule of small size in the neighborhood of the main granule, but never, in the writer's observation, have two large granules occurred in a single, thin, ring-shaped tertian parasite.

The significance of these double granules is not clear. The appearance of two very small, compact, spore-like bodies, partly fused together, as may occasionally be seen, indicates that such forms may sometimes result from the early union of the bodies of two very young parasites. The accessory granules in the thin rings have always appeared too small to have been derived in the same way, and probably result from the precocious subdivision of the main granule. The accessory granules may arise, therefore, (1) from the incomplete fusion of the original granules which go to make up the spore in the parent rosette, or (2) from a precocious subdivision of the chromatin, as suggested by Ziemann, or (3), as seems most likely to be the case with the compact bodies, by the incomplete separation of the bodies of two spores in the rosette.

In any case, the existence of more than one granule in a single parasite presents no difficulty for the theory of conjugation. The identification of twin parasites in the writer's specimens has always been based, not merely on the presence of multiple nuclei, but also on the undoubted presence of the bodies of two distinct parasites. In some of the conjugating forms, moreover, three masses of chromatin granules were rather frequently seen in various stages of union, when only two bodies of parasites were to be found in the red cells. This appearance, which was at first very puzzling, can be positively referred to the conjugation of one compact parasite

with double chromatin granules and one thin ring-form with single granule. In one case single compact parasites with double granules twinned with thin ring-forms, and large conjugating forms with three masses of chromatin, were present in considerable and nearly equal numbers. It appears, therefore, that the presence of two large and equal masses of chromatin in one infected red cell indicates, with few exceptions, the presence of two parasites. The exceptions are disposed of by the fact that three nuclei are sometimes seen in conjugating forms, two of which are usually derived from two very young compact forms uniting very early, probably in the rosette, and the third from subsequent conjugation with a ring-shaped parasite.

The further development of single young parasites with accessory granules may be followed in rare instances. The accessory granule divides, as does the main mass of chromatin, and, later, unites to form one clump of granules in the full-grown stage. Throughout these stages the total bulk of the two chromatin masses appears not to exceed the average of single parasites, whereas in the conjugating forms the excessive quantity of chromatin in all stages is a very striking feature.

In all the examples of such single parasites that the writer has seen, the unequal size of the chromatin masses was distinct when there was no indication of the presence of the bodies of two parasites in the same cell. These forms, therefore, differ entirely from the conjugating forms above described, in which multiple chromatin masses are always associated with multiple parasites. The writer has never seen more than two masses of subdivided granules in a single parasite, whereas three large and equal masses may be observed in two conjugating forms.

Ziemann describes the appearance of multiple chromatin masses in young tertian parasites. He was at first uncertain whether these granules were referable to the presence

of two fused parasites or to early division of one nucleus, but finally accepted the latter explanation. He describes the separation of one, or rarely two, accessory granules from the original mass in cells infected by single young parasites. Sometimes the accessory granules was much smaller than, sometimes nearly as large as, the parent granule. All these appearances the writer has seen in single parasites, less often in single members of the conjugating pair; and he agrees with Ziemann that they may represent merely a precocious subdivision of chromatin, but the conjugating forms of the writer's observations are quite different and do not appear in Ziemann's descriptions.

Secondly, it may be objected that it is impossible to determine when the bodies of two parasites are really united, as one may overlap the other and produce a false impression of union. This difficulty is undoubtedly present with some of the young forms; but, with others, the appearance of the parasites toward the completion of the process, when amœboid motion is subsiding, is, on the contrary, absolutely convincing that the bodies are actually fused. The significance of two or three large masses of chromatin surrounded by one achromatic zone is also unmistakable.

Thirdly, it may well be pointed out that examples of twin parasites of advanced development, presegmenting bodies and rosettes, are sometimes seen in severe tertian infections, furnishing examples of twinning without subsequent conjugation. This fact is a matter of rather common observation, and, in the writer's experience, there have been some cases in which it was especially noted. In one infected cell were found, for instance, a large rosette and a compressed hyaline body. In another were seen one perfect rosette, one imperfect presegmenting body, and one compressed hyaline body.

It may be said of these twins which proceed to segmentation without conjugating, that they are vastly less numerous

than the conjugating forms of young twins seen in the same or other specimens. The writer has seen hundreds of conjugating forms within a few months, but remembers only three or four twinned rosettes seen in as many years.

In the cases showing twinned adult parasites, a few younger couples were seen which showed no attempt to conjugate. The great majority of these young parasites were the typical tertian ring-shaped parasites, while the small compact forms were hard to find. There is in this fact an indication that conjugation requires the presence of two somewhat differentiated parasites, as already described, one a compact body and the other a ring-shaped parasite. Observation of recent cases has borne out this conclusion.

Finally, the comparative absence of older twinned parasites may be referred to the death and extrusion of one of the twins while the other proceeds to full development alone.

In some gregarines in which multiple infection of cells and conjugation of parasites is common (Klossia), one of the parasites usually succeeds in dwarfing its companions and reaches full developmnet alone. The dwarfed or dead parasites are then found in the cell alongside of the growing form (Wolters; Clarcke). In some instances of multiple infection by full-grown malarial parasites there are evidences of compression and death of the younger of two or three organisms. More often both parasites appear to be equally favored. In any case, the remains of the dwarfed parasite ought to be found if one member of the pair commonly inhibits the growth of the other. In the writer's cases showing conjugation no traces of dwarfed parasites could be found, and, while young twins were extremely common, all the older parasites were single. It therefore appears to be impossible to explain the entire absence of older twinned forms, and especially of traces of any abortive individuals, on any other basis than that of conjugation.

The writer finds, therefore, that the usual result of twin-

ning of tertian parasites is conjugation; that twins sometimes grow to maturity without conjugating, for reasons which are not clear, but apparently when both parasites show the usual ring-form; that the union sometimes involves three parasites, but probably always requires the presence of one or more compact, densely staining forms, which do not commonly assume the ring shape, and one of the typical tertian rings.

A further inquiry relates to the frequency with which conjugation occurs and its position as an essential or accidental phenomenon in the progress of malarial infection.

It would seem that a process so fundamental as the conjugation of individuals, if it occurs at all, ought to be an invariable feature of every active infection, but it must be admitted that the majority of specimens taken from routine cases fail to show distinct traces of the process. Nevertheless, it is probably a very common occurrence, since the writer has found little difficulty in securing specimens containing a few conjugating forms.

The four cases originally referred to as exhibiting very abundant conjugating forms presented several characteristics in common. They were all very rich infections, the Montauk case showing more parasites than the writer has ever seen in any other benign tertian infection. The three New York cases were examined early in the course of the disease after severe febrile paroxysms. They all responded promptly to quinine, although one relapsed when quinine was omitted. Conjugating forms are usually few or wanting when the total number of parasites is small, or after quinine has been given, or in third or fourth paroxysms. *Conjugation seems to be a feature, therefore, of the early stages of rich infections.*

This conclusion from clinical data accords with the well-known significance of conjugation among many protozoa, which are able to reproduce two or three generations through

conjugation, after which another type of sexual reproduction becomes obligatory.

The further examination of specimens exhibiting conjugating forms develops other peculiarities of great interest.

Single parasites of both types, *i.e.*, compact, densely staining bodies with one or two large chromatin granules, and the thin ring-shaped parasites, can be traced through later stages of development. The compact bodies remain densely staining and compact throughout their growth. They are not often found in distinct ring-form inclosing hæmoglobin, but usually remain compact, while developing short amœboid processes. They are usually of smaller size in all stages than are other equivalent tertian parasites, but the infected cells are slightly swollen. In some respects they resemble quartan parasites. In the full-grown stage these bodies are still densely staining, with very distinct chromatin granules. The writer is not certain that they ever segment, but he has been able to trace them up to a form in which there are six subdivided groups of chromatin granules. Now, the true presegmenting tertian form does not develop its sixteen to twenty separate nuclei by the subdivision of the parent group of granules first into two, then into four, eight, and sixteen masses, but the whole parent mass flows out into the body and is *at once disseminated* into the final number of nuclei destined to form spores. These densely staining bodies with from four to six chromatin masses are distinctly different in appearance from the true presegmenting bodies. The writer finds them, on the other hand, much more like the bodies which in shed blood exhibit undoubted evidence of the beginning formation of flagella. Indeed, in some of the densely staining compact bodies with six chromatin masses obtained directly from the circulating blood, the chromatin has appeared in elongated rod-form as it appears in forming flagella in shed blood. The writer has not traced the extrusion of flagella from

these compact bodies with six nuclei, but in specimens made from fresh blood which has been allowed to stand in a moist chamber for from ten to twenty minutes and stained by Nocht's method, flagellating forms show marked resemblance to the compact bodies with six nuclei seen in specimens made from fresh blood in the ordinary way, but those flagellating forms do not stain so densely with methylene-blue.

Likewise the development of single ring-shaped tertian parasites may be traced in the same specimens with the others. As these forms increase in size they are characterized by their hyaline appearance and tendency to stain lightly with methylene-blue, and by the comparatively small quantity of finely divided chromatin. No presegmenting bodies could be found in these cases which appeared to show the characters of this pale, full-grown parasite, and the writer is not certain that it ever segments. On the other hand, the pale-staining, often extra-cellular, non-flagellating bodies seen in blood from fifteen to twenty minutes after shedding show considerable resemblance to the pale forms derived from single ring-shaped parasites which have not conjugated.

These observations accord in some, but not in all, respects with the descriptions given by Bastianelli and Bignami of the tertian microgametocytes and macrogametocytes in the mosquito's stomach.

According to these observers, the microgametocyte, or male flagellating form, exhibits from five to six times as much chromatin as the other. This chromatin may lie in one central mass or in a network of threads, but is always compact and densely staining. It nearly always produces six flagella. The macrogametocyte, or female forms, shows an eccentric nucleus with very scarce chromatin granules, and is a very pale-staining body. They trace these two forms indistinctly in the circulating blood, as follows:

"From nine to six hours before the chill, besides tertian rosettes, there are to be seen bodies of equal or larger size, with a single vesicular nucleus and subdivided chromatin grains or rods which lie far apart. In bodies one-third smaller than the above-described forms similar rods and threads may be seen, and it is reasonable to suppose that the forms destined for development in the mosquito have from their earliest stages a characteristic form. In the circulating blood, however, these early forms are not seen, because, as in the development of crescents, they are confined to the marrow."

The writer has not had an opportunity to examine malarial blood from the mosquito's stomach, but in shed blood kept moist for fifteen minutes he has seen the early stages of the formation of flagella, and finds such bodies to resemble in size, number of chromatin masses, and general staining qualities the fully developed compact form seen in conjugating specimens.

That microgametocytes and macrogametocytes develop especially in the bone marrow, as suggested by Bastianelli and Bignami, may explain their usual absence from the peripheral blood, where the writer has seen the separate development of the two distinct forms of parasites in only a very few cases. At present, analogy with the æstivo-autumnal parasite is the only evidence favoring the suggestion that the bisexual forms of the tertian parasite develop principally in the bone-marrow, as the opportunity to examine the marrow of cases of tertian malaria is, fortunately, very rare.

In the æstivo-autumnal parasites, the bisexual forms, the crescents, have for some time been separated into two classes. McCallum describes distinct differences between the flagellating crescent, or male, microgametocyte, and the non-flagellating female macrogametocyte in the parasites of birds. Bignami and Bastianelli, as also Celli, note several

distinguishing points in the male and female crescents of the human parasite. According to these observers the microgametocyte is smaller, assumes the spheroidal form, stains lightly with methylene-blue, and its nucleus is apt to be eccentric and not to show a vesicular type. The macrogametocyte retains the fusiform shape, stains densely, and exhibits a central vesicular nucleus surrounded by pigment. After fertilization, the macrogametocyte stains still more densely, the nucleus may migrate to one pole, and the pigment becomes disseminated. All these features the writer has found to characterize individual crescents in circulating blood, and cannot regard them as indications of fertilization unless it is admitted that under some conditions crescents may become fertilized in the circulating blood.

Mannaberg believes that crescents are syzygia developed by conjugation of two amœboid individuals. Recent study of related protozoa, however, has left little support to such an hypothesis. Crescentic bodies in protozoa invariably develop by segmentation of an encysted body, and the writer can find no instance of the development of a single sex-ripe form by conjugation of two individuals. At any rate, if crescents develop through conjugation, the process is of entirely different significance from the present type of conjugation of tertian parasites.

A natural inquiry relates to the occurrence of conjugation among æstivo-autumnal parasites, with which twinning of young forms is decidedly more common than with the vernal parasite.

An increased difficulty in determining this question is found in the disappearance of æstivo-autumnal parasites from the peripheral blood just at the time when conjugation of forms might be expected to occur. The writer has already described two forms of æstivo-autumnal rings, but has been unable to trace their development, either in smears of the viscera of fatal cases or in the peripheral blood of five

cases in which numerous parasites of all stages remained in the peripheral blood. During this search for conjugating forms, several examples of twinned, half or full-grown, or segmenting, parasites in the same red cell were encountered, but they were vastly less numerous than young twins. If conjugation occurs it probably lasts over a very brief period only, and can be demonstrated only in smears of visceral blood where the parasites have massed in large numbers. In a few quartan specimens the writer has seen no traces of either twinning or conjugation.

The Biological Significance of Conjugation.—Comparative biology offers an abundant opportunity for the occurrence of conjugation of malarial parasites. Of protozoa, conjugation is most frequently observed among gregarines, which exhibit at least two types of the process. In one of these types, one or more embryonal gregarines attach themselves to the body of a second or third individual, forming a short chain, much as do certain bacteria (Klossia). In this relation they proceed for a variable time in their development. Pfeiffer refers to this process, apparently, as a "spurious conjugation," employing the term "embryonal cohesion" (*embryonale Verklebung*). In the second and more important type, two partly or fully developed individuals become encysted together, developing sporocytes and initiating a completely new phase of existence in the life of the parasite.

Pfeiffer describes the gradual fusion, first of the bodies, later of the nuclei, of conjugating sporozoa. Wittaczil also describes the fusion, first of the bodies, later of the nuclei, of a rare form of gregarine, and refers to similar processes in other protozoa. Wolters gives minute descriptions of conjugation in gregarines, in which complex nuclear changes are concerned. In all these cases, however, conjugation precedes encystment, showing that this particular cycle of the parasite undergoing conjugation is not homologous with

the pyrogenous cycle of the malarial parasite, which becomes encysted in the mosquito's stomach after fertilization by the flagellum, and not after conjugation.

On the other hand, it is a well-recognized biological principle, stated, among recent authors, by Leuckart, Pfeiffer, Sedgwick, Haeckel, and others, that conjugation among protozoa may be the only sexual feature of reproduction during a limited number of generations, after which the reproductive capacity ceases and must be restored by the development of bisexual forms, and usually by the appearance of an entirely new phase of existence. With the malarial parasite, conjugation appears to fulfil just such a purpose, favoring the development of the amœboid pyrogenous forms of the organism over a few generations, after which there is a tendency to develop separate bisexual forms, which, in the mosquito's stomach, initiate a new phase of existence in a new host. In this respect malarial conjugation must be admitted to have the full significance which attaches to it in related protozoa, and cannot be classed as a form of embryonal cohesion or of spurious conjugation.

The spontaneous disappearance of malarial infections in the human subject may thus be explained by the gradual failure to reproduce by conjugation, and the development of parasites singly into sexual individuals, sterile for the human host, but adapted to development in the mosquito. Such quiescent stages of related infections are very commonly observed in the blood of snakes and birds, etc., which, for months, harbor with impunity countless numbers of the crescentic bodies awaiting transfer to a new host.

In current literature on related protozoa there appears to be no reference to conjugation of individuals belonging to a cycle which is homologous with the pyrogenous cycle of the malarial parasite. This is probably owing to the fact that observed forms of the coccidia and gregarines belong to the encysted cycle, which in the malarial parasite oc-

curs in the mosquito, while the other forms, if they exist, have not yet been described or fully studied.

The occurrence of conjugation among malarial parasites establishes more fully the parallelism believed to exist between the life histories of this and related protozoa.

The malarial parasite may be said to begin its existence, in the human host, by a series of generations of amœboid bodies produced after conjugation of partially differentiated individuals. After the capacities of this method of reproduction have been exhausted, the sexes become separated, the male forms being represented by the flagellating bodies, microgametocytes, and the female by the large, pale, hyaline, non-flagellating bodies (macrogametocytes). These forms are sterile for the human host, but in the mosquito fertilization of the macrogametocyte by the flagellum or microgamete takes place, and the resulting motile form, the vermiculus, penetrates the tissues of the mosquito and becomes encysted. From this cyst develop the germinal rods which are inoculated into the human host through the salivary glands of the mosquito, to begin anew the pyrogenous or amœboid cycle. At several points in the series there remain wide gaps in our knowledge. We do not yet know how the germinal rods are transformed into amœboid bodies. The development of the sexual forms of the tertian parasite, as described by the writer, can at present only be offered as a probability, not as a demonstrated fact, while the origin of æstivo-autumnal crescents is as yet entirely obscure. At the other end of the series there is possibly an entire new phase of development of the parasite or the production of some "resistant body" in the external world apart from either man or mosquito. The present paper need not, however, be burdened with the obscurity of these related problems, as its object is merely to present evidence, which is believed to be demonstrative, of the occurrence and significance of malarial conjugation.

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MEMORIAL ADDRESS ON THE LATE SAMUEL SMITH PURPLE, M.D.

BY STEPHEN SMITH, M.D., LL.D.;

NEW YORK CITY.

Mr. President and Fellows:

Samuel Smith Purple was born on the 24th day of June, 1822, at Lebanon, Madison County, N. Y., and died on the 29th day of September, 1900, at his residence, 36 West Twenty-second Street, in the City of New York. His life extended over a period of seventy-eight years, three months, and five days, or the last three-fourths of the nineteenth century.

Dr. Purple's ancestry was English, both on the paternal and maternal side. Christopher Purple (1580–1605) came to America from the County of Essex, England, and from him descended the Purple families of Connecticut. Dr. Purple was the seventh in descent from Edward Purple, who settled in Haddam, Conn., in 1674. His maternal grandfather, Dr. James Sheffield, of Earlville, N. Y., was also of English descent.

Dr. Purple began his life under conditions which would of necessity tend to develop a strong and self-reliant character. His father, Lyman Smith Purple, and his mother, Minerva Sheffield, belonged to the class of adventurous pioneers who emigrated from New England to Central New York and converted a wilderness into habitable homes. His business was that of tanner and shoemaker, two trades that were very naturally united in one in the new settlements. To this trade the subject of our sketch was rigorously bred, with

only such opportunity for an education as the public school afforded. Every one familiar with the common school of the rural districts at that period can appreciate the advantages which he had for laying the foundations of a successful professional career. The bare rudiments of the primary branches alone were taught and the methods of instruction were so imperfect that the student was practically left to himself. After the age of thirteen young Purple only attended the school in the winter, and at sixteen his opportunities for an education ceased altogether, for he was compelled to devote himself wholly to the business of his father. It appears from some notes which he made of his boyhood that it was devoted to the usual sports of children of his age, hunting and fishing being his favorite employments, which led to the remark of the members of the family that "Sam would never be good for anything else." It is evident now that he was unconsciously making preparation, physically and mentally, for the terrible struggle which awaited him at the outset of his professional career.

The failure to secure a thorough education in his youth was a source of profound regret to him in his later life and greatly embarrassed him in his subsequent work in the field of medical, historical, and genealogical literature.

In 1836 the father removed from Lebanon to Earlville, Chenango County, N. Y., where he pursued the business of manufacturer and dealer in shoes until his death in 1839. With this last event new responsibilities devolved upon Samuel, the eldest son. At the age of seventeen he had to assume the charge of the business and the support of the family, now in reduced circumstances. That the task was difficult is apparent from the fact that it required three years of unremitting application of all his energies to relieve the estate of debt and secure for his mother a very humble home in the village.

But his thoughts were not altogether confined to his bus-

iness during this trying period, for we learn that he not only conceived the idea of studying medicine, but actually began reading such books as were accessible to him. He was probably prompted to undertake this study through contact with his grandfather, Dr. James Sheffield, and a relative, Dr. W. D. Purple, of a neighboring county. He obtained books from the village physician, Dr. David Ransom, and devoted every leisure moment to their study. His habit was to rise at 4 o'clock in the morning and to study until 7 o'clock, when he went to his shop and during the day studied, while working on the bench, with his book placed in a rack before him. He carried on his studies in this manner for a long period without the knowledge of his family, and it was only when he engaged in a discussion on a medical subject with his grandfather, Dr. Sheffield, and was rebuked by his mother for presuming to contradict the old gentleman, that he announced that he had been a student of medicine for a long period. She used to relate the circumstance of finding a skeleton in an old sofa in his room, where he studied it unseen, and the horror its presence in the house created until she compelled its removal.

In 1842, at the age of twenty years, he had so far succeeded in his father's business that he prepared to attend a course of lectures in a medical college. Geneva Medical College then offered the best opportunities for a student in his financial straits. Dr. Ransom secured for him, through the Censors of the State Medical Society, a free course in that college. To acquire the necessary means of support during the term he worked on a farm for wages during the months of June, July, August and September, and on the first of October went to Geneva, having only sufficient means for his support during the term by the exercise of the most rigid economy.

Geneva Medical College was at that time one of the most reputable schools in the country. It was the legitimate suc-

cessor of the Western College of Physicians and Surgeons, Fairfield, Herkimer County, N. Y. Its faculty contained some of the most eminent teachers in the country. Its professor of chemistry was James Hadley, from whom descended the Hadleys of Yale. Dr. Spencer, one of the most eminent physicians of that day, taught medicine; Dr. Coventry was a painstaking lecturer on obstetrics; Dr. Frank H. Hamilton gave brilliant lectures on surgery; Dr. Webster, lately of Philadelphia, taught anatomy; Lee, of New York, gave the course on materia medica. The value of this course of lectures to a student who had been thus far his own instructor consisted in its power to systematize his studies and teach him how to study. In this respect the term at Geneva was of great value to the student Purple and was regarded by him as the beginning of his real course in medicine.

During the following summer he pursued his trade and continued his medical studies with greater zeal and with far greater success than previously. Through the agency of his relative, Dr. W. D. Purple, a member of the State Board of Censors of the State Medical Society, he secured a free course of lectures in the medical department of the University of the City of New York, which had an available beneficiary fund. In the autumn of 1843, with only money sufficient to sustain him through the term, he came to New York and entered the University Medical College. This college had been in existence but three years, having been organized in 1841. At its head was Dr. Valentine Mott, acknowledged the foremost surgeon of the world, and in its faculty we find the names of John W. Draper, Granville Sharp Patterson, Martin Payne and others of equal repute at that time. The inspiration which he caught from the teachings of these eminent professors remained a last heritage. He often spoke of them individually and always with expressions of gratitude and even reverence.

He graduated at the close of the term in March, 1844, and

returned to his home in Earlville. Among his early friends in the village was a theological student who became the pastor of the Laight Street Baptist Church of this city. While the young medical student was attending lectures at the University Medical College he renewed his acquaintance with his clerical friend, the Rev. William W. Everts, and the question of his future location in practice was discussed and many inducements to locate in New York were advanced. At first he shrank from what seemed to him an undertaking doomed in the very nature of the conditions to a most disastrous failure. His highest ambition had been to become a respectable practitioner in a country community where his limited means would be sufficient for his support. But when in the quiet of his mother's home he calmly considered the two phases of professional life spread out before him, the country life with competency but no future, and the city life with its early struggle and unlimited opportunities for development, he calmly but resolutely chose the latter and prepared for the struggle.

In this incident in the life of young Purple, as in the same incident in each of our own lives, we find the true and supreme test of character. He had come to the parting of the ways. On the one hand was the quiet and uneventful life of the country practitioner, with its competence, its good citizenship and universal esteem, but devoid of professional associations and the stimulus to high attainments and possible preferment. On the other hand was the life of the New York City physician, with its years of privation and toil in the tenement houses and dispensaries, its fierce conflicts for professional advancement, but with its vast opportunities for improvement, its constant incentives to higher achievements and the possibilities of ultimately winning an honorable position in the profession. It is, indeed, true that many who have wealth and friends decide to try their fortunes in the city, with the mental reservation that, failing, they will

escape to the country with the prestige of having been once located in the city. And it is an interesting reminiscence of the older physician to recall the number of young men of this class who began their career in this city as his contemporaries, but whose names have long since disappeared from the Medical Directory. But far different is it when the question of location in the country or city confronts the ambitious young graduate who has not even the means of transportation to his destination, much less of support when he arrives there. But such was the momentous problem which our graduate had to solve. Tough as that problem was he grappled it with the energy of a great and self-reliant character. All his immediate interests, coupled with the persuasion of his family dependent upon his immediate success and of his friends, seemed to demand imperatively that he should locate in a country town. During several weeks he studied the situation, calmly and judicially weighing the arguments which arose in his own mind or were presented by his friends. The pivotal question with him was "What shall be my future?" He had an honorable ambition to gain a professional reputation, and to do so he must have adequate opportunities. These opportunities could only be secured in the city. He counted the cost and determined to locate in New York.

Preparing for his residence in this city young Purple found he possessed a poor wardrobe and $25 in money. In order to save as much as possible of his scanty means he engaged as a laborer on a canal boat part of the distance and arrived in the city in May, 1844, with $17.50 in hand with which to begin the "fight for life." He took a room on the second floor of a house in Hudson Street, near Canal, and in the immediate vicinity of his Earlville friend, Rev. Mr. Everts, to whom he was greatly indebted for many substantial favors and constant encouragement. For the purpose of occupying his leisure hours with clinical work as well

as to relieve the tedium of the days, weeks and months of waiting for business which was to be his lot, he entered the service of the old Marion Street Maternity, and subsequently he obtained an appointment in the New York Dispensary in Centre Street. Thus he passed his first, second, and third years, each closing with a deficit in his finances, though he economized to the extent of scarcely purchasing new clothes. The fourth year was marked by a decided gain in the quality of his patients and a much better income, and the fifth year he was not only able to place himself on a much better footing by having his own house, to which he removed his mother, but he liquidated his debts and began life quite independently.

During my long and intimate acquaintance with Dr. Purple he seldom alluded to his trials during this probationary period, apparently shrinking from even the memory of them. But from time to time I learned many of the details of the obstacles which confronted him and the heroic struggle which he made to overcome them. He had anticipated hard work and privations, and these he did not fear, for they had been the conditions in his youth with which he was perfectly familiar. Subsequent events, however, prove that while he justly estimated his power of endurance under the most rigorous circumstances he had no real conception of the terrible ordeal that awaited him. Some of us can more or less correctly appreciate the indomitable courage it required to fight this battle to a successful issue.

It would be well if we could detail all the pathetic incidents of the first five years of our friend's professional career, for only in that review can we estimate at its true value the innate force of his character; such a recital would also impart a lesson of the first importance to the graduate of to-day, for it would prove in a striking manner that in our profession as in every department of business, the most successful men in the long run are those who in early life are trained in

the school of bitter experience to practise all the arts of self-reliance and self-help. But we must forbear opening these pages of his life history, for to him they were too sacred to be revealed even to his most intimate friends. In a few notes which he left he alludes to these early years, and thus puts his seal of disapproval upon any revelations of his experiences during that period: "The struggles and trials through which I passed during the first three or four years will ever remain a secret in my bosom. If it had not been for one or two warm friends I could not have succeeded in the task I had undertaken. It was not until five years had elapsed that I was enabled to pay my expenses and liquidate the obligations incurred up to that time."

The professional life of Dr. Purple was altogether uneventful. Naturally diffident and retiring he sought no position in the hospitals or medical schools of the city, but quietly devoted himself to his practice and bibliographical pursuits. He was elected a member of the Pathological Society in 1846 and was a constituent member of the Academy of Medicine, which he aided in organizing in 1847. He also took a deep interest in the organization and management of the Society for the Relief of the Widows and Orphans of Medical Men. An event of much importance to him occurred during these five years of struggle, for it initiated the work to which he subsequently devoted so much of his time and means. While attending lectures at Geneva he became slightly acquainted with Professor Charles A. Lee, of New York, then Professor of Materia Medica in that college. In 1845 Dr. Lee became editor of the *New York Journal of Medicine* on the death of its founder, Dr. Samuel Forry, and as his duties connected with his professorships in country colleges required his absence from the city several months he sought the assistance of Dr. Purple. So well did the latter perform the duties of this responsible position that when Dr. Lee resigned the management of the *Journal* in

May, 1848, Dr. Purple was chosen by the publisher as his successor. He continued to manage the *Journal* until 1858, when he retired to devote himself more thoroughly to his practice and other pursuits.

Dr. Purple's contributions to medical literature were few in number and were for the most part made during his connection with the *Journal.* His first paper appeared in the *New York Journal of Medicine* of March, 1846, and is entitled "Menstruation; Its True Nature and Office, With a Review of the Evidence of Its Vesicular Origin, With Illustrative Cases." The object of the author was to contribute the results of his studies and investigations, through the aid of the coroner's office, to the controversy then going on as to the function of menstruation and the diagnostic value of the corpus luteum as to the occurrence of conception. The facts which he contributed from his own studies of cases obtained from the coroner are more convincing than those gathered from other sources. At the close of the paper he intimates that he has formed opinions in regard to the corpus luteum which he may make public. Accordingly, in the November number of the *Journal,* 1846, he published a very elaborate paper entitled "Corpus Luteum; Its Value as Evidence of Conception, and Its Relations to Legal Medicine, With the Characteristics of the True and False. Being an Attempt to Reconcile the Conflicting Opinions of Writers by the Recent Discoveries in the Physiology of the Ovaries." The medical literature of that period contained many controversial articles on that subject by eminent writers at home and abroad, but none show a larger grasp of the subject and few equal it in literary style and argumentative force.

When it is remembered that these two elaborate articles appeared during the second year of his settlement, while he was laboring under innumerable embarrassments, we can better appreciate the sturdy character and indomitable will of its author. And perhaps what is more surprising in view

of his limited education and his entire lack of training in composition is the chaste and classical language which he employed and the logical presentation of facts.

During the four succeeding years he devoted himself assiduously to his practice and to his editorial duties. The *Journal* showed evidence on every page of his personal supervision, and the high order of the original papers showed a wide acquaintance of the editor with the best writers of that period.

The third paper of our author appeared in the *Journal* of July, 1850, and is entitled "A Literary, Historical and Practical Sketch of Acrania, 'Brainless' or Pseudencephalus Monsters." The paper is illustrated by three well-executed engravings of the head of a monster of this type met with in his practice. The paper was written in the same clear, classical style as the preceding papers and shows the same evidence of extensive research of medical literature for illustrative facts.

In 1853 Dr. Purple issued a pamphlet entitled "Contributions to the Practice of Midwifery, Forensic Medicine, Physiology and Pathology, with Illustrations." The several subjects treated are illustrated by cases occurring in his own practice or to which he had been called in consultation by neighboring physicians. It was an original paper of merit, and at that time attracted considerable attention. A feature of the paper which interests us is the evident tendency of the author to devote himself to the study of the diseases of women. This evidence was strengthened by an announcement that a popular English work on the "Diseases of Women" would be edited by Dr. Purple and published by the firm of Wood Brothers. The projected publication never matured.

In 1855 appeared a paper in the *Journal* entitled "Statistics of Injuries of the Heart: Observations on Wounds of the Heart and Their Relations to Forensic Medicine, With a

Table of Forty-two Recorded Cases." The occasion of his writing this paper was the death of a notorious pugilist by a pistol-shot wound of the heart which he survived several days. Much doubt was entertained as to the implication of the heart in the wound, owing to the survival of the patient for so long a period, but the autopsy proved that the ball penetrated the walls of the heart. The paper shows great care in its discussion of the questions then at issue, and the conclusions are fortified by a judicious use of the large number of cases collected. The influence of the paper upon surgical opinion was very great, for it was received as authoritative.

In the same year he published in the *Journal* a description of "A New Trephine, With Remarks Upon Its Construction," and accompanied by an illustration. He states that "Several years since, owing to difficulties that arose in the operative management of a case of severe and extensive injury of the head, attended with depression and extravasation of blood under the cranium, in a near relative, I was led to engage in a series of experiments which at last resulted in the construction of the instrument represented." The mechanism of the instrument consists of the ordinary crown of a trephine, attached at right angles to a straight handle having a hinge-joint; a centre pin with a sliding handle, which can be moved up or down, enabled the operator to make more or less pressure upon the crown with his left hand, as the occasion requires. He claimed the following advantages for his instrument, *viz.*, (1) in the mode of applying the motive power; (2) in the freedom and ease of working it; (3) in its uniformity of action; and above all (4) in the less consequent liability of injuring the brain and its covering. The instrument is a very ingenious device, and in practice accomplishes all the inventor claims for it, but it never came into even limited use by surgeons, and has been relegated to the museum of surgical curios.

Dr. Purple also invented an instrument designed to enable the operator to rupture a cyst or detach an adenoid growth located deeply in the pharynx but within reach of the end of the index finger. The instrument resembled the artificial finger-nail of Darby, Browne, Lauterbach, and others.

The seven papers above reviewed were written during the first decade of Dr. Purple's career, and such was their general excellence that they established his reputation as a medical writer of high order. But circumstances now diverted him from the path along which he was advancing so successfully, and he never wrote another scientific medical paper. His connection with the *Journal* had brought him into familiar relations with many of the leading physicians of the city. The one who exerted the greatest influence upon him was Prof. John B. Beck, of the College of Physicians and Surgeons. Dr. Beck was a very scholarly man and had a large and valuable library, which he had been many years perfecting, especially in the department of rare medical pamphlets. Commenting upon the importance of collecting and preserving the early medical literature of the country, much of which was originally printed in pamphlet form, he concluded by urging the young editor to avail himself of the opportunity which his position afforded him of securing and preserving every early publication obtainable. At the same time he gave him a large number of pamphlets, which really formed the nucleus of the enormous collection which he subsequently made. These suggestions of Professor Beck stimulated into the greatest activity the latent passion for bibliography, which was finally to absorb so much of the time and means of his young friend.

From this time onward his business satisfactorily increased, both in quantity and quality, and though he never attained to a large and lucrative practice, his income satisfied every ambition except the single one of providing all the means he craved for the purchase of books. But when

the opportunity offered of securing rare works he did not let it pass on account of a momentary want of money. His credit was good with all classes of book-dealers and with most of the purveyors of old books he had standing orders for the purchase of rare editions. For the period of half a century he maintained a close personal acquaintance with all dealers in old books, and no quaint old volume in the second-hand book stores or in the auction rooms escaped his careful scrutiny. At first his attention was especially directed to rare medical books and pamphlets, but constant association with the dealers in old books drew his attention to other inviting fields of bibliographical research. He was thus led to the study of American historical literature, and his collection of rare books and pamphlets relating to the early history of New York was very valuable. It very naturally happened that these investigations into the history of the early families drew his attention to the important and enticing department of genealogical research. To these subjects he finally devoted a large amount of his leisure time, and his collection of books and pamphlets relating thereto was probably not surpassed by any private library in this country. He was one of the active promoters of the Genealogical Society of this city, and was one of its officers from the time of its organization. As a member of its publication committee he was specially interested in the publication of the organ of the Society, *The New York Genealogical and Biographical Record,* to the pages of which he contributed much valuable matter.

Dr. Henry R. Stiles, who was associated with Dr. Purple for many years in the editorship of the *Genealogical and Biographical Record,* in his sketch of his associate makes the following allusion to his relations to the Genealogical Society: "Singular modesty and reticence as to himself, his labors and plans, concealed from his friends and associates both in the profession and in our society, the value and im-

portance of his life-work. It is only now, when death has removed him from the spheres of his activity, that we fully appreciate the value of what he has done. We remember his quiet ways, his few but always helpful words, his gentle measured speech, and the interest that spoke so plainly from his eyes, as we took sweet counsel together in our society and committee meetings; and we are thankful to have been so long permitted the companionship and friendship of so true a man and so wise a counsellor."

The most important event in the professional life of Dr. Purple was his election to the presidency of the New York Academy of Medicine. This event occurred on the election of officers for the year 1875, a quarter of a century after his settlement. It was an honor which he greatly prized and which he richly deserved. He had labored diligently to advance the best interests of the Academy from the outset and had contributed freely his time, his influence, and whatever his slender means would permit to secure for it a library and a permanent home. In his inaugural address, delivered January 21, 1875, he dwelt feelingly and eloquently upon these two themes, which were then agitating the members of the Academy. He said: "It requires no argument here to show the necessity or value of a great reference medical library, located in this city. . . . The time has arrived in which it is imperatively demanded." The permanent home of the Academy which was pictured in his mind he described as "a hall where the whole profession may meet on common ground—one which shall be the recognized medical centre—within which the various medical organizations of the city may have ample accommodations for holding their meetings; where museums and libraries may be gathered and where every department of medical study and investigation may find accommodation. . . . It is in . . . the possession of a home that many of the better and brighter hopes of the profession are

centred. In it we see the facilities for a greater centralization of the power and influence of medical men in all matters which appertain to medical science and also to the health interests of the public at large; may it not lead to a union of the scattered resources and medical organizations of the city? . . . This Academy must eventually have a building not less imposing in its appearance than similar structures in the metropolis and adequate in all its appointments to the growing wants and future exigencies of the profession." Fortunately he lived to see the hopes and wishes that he entertained finally and fully realized.

He was honored with an election to the presidency of the Academy a second time, and on January 18, 1877, delivered his inaugural address. He chose for his subject, "Medical Libraries," and in it, after sketching the efforts of the Medical Society of New York, the New York Hospital and the Journal Association to establish medical libraries, he narrates the discovery which he made of the little brochure by Dr. Samuel Bard, entitled "An Inquiry into the Nature and Cure of the Angina Suffocativa, or Sore Throat Distemper, As It Is Commonly Called by the Inhabitants of This City and Colony," printed in 1771. He states that he "rescued it from the press-box of a second-hand paper dealer in this city *in transitu* to the maw of a paper-mill." On examining this pamphlet he became satisfied that in his description of the epidemic of 1770, in this city, Dr. Bard had very accurately and graphically described the disease now known as diphtheria. He quotes at great length from the pamphlet to prove that the clinical features of the "Sore Throat Distemper" of 1770 in this city were identical with the modern diphtheria. He concluded his address with the following appeal: "Will any fellow of this Academy from this time forward despise the day of small things, or consign to collectors of rags or paper-stock the pamphlets or old editions of medical works which he may

weed from his library or garret? Will not all bear in constant remembrance that here, in this our own medical home, will be gratefully received and carefully treasured every tract, pamphlet, book, manuscript, engraving, portrait, small or great, which may be donated?"

During Dr. Purple's presidency of four years the Academy made rapid progress, both in creating the great reference library that he so strenuously urged in his inaugural, and equally in securing a permanent home of its own. His contributions to both objects were of vital importance. To the library he gave that priceless treasure *the serial medical literature of this country.* What that collection cost him of time, money, and patient toil no one can have the remotest conception. For more than a quarter of a century he ransacked every collection of old pamphlets accessible to him in this and other cities. Many were the occasions when he despaired of completing sets, but by correspondence with dealers in old books, with the older physicians, and by advertising in medical periodicals, offering at the same time suitable payment, he succeeded in completing full sets of all of the medical periodicals ever published in this country. From the first his ultimate purpose seemed to be, though not expressed in words, to have the collection form part of the projected reference library of the Academy. This purpose was carried out in part when he donated upward of 5,000 volumes of American medical journals to the library of the Academy. Though the Academy already had a considerable collection of miscellaneous medical works, it is generally recognized that the addition of Dr. Purple's contribution of the complete serial medical literature of this country laid the foundations for a reference library on which the present magnificent superstructure is being reared.

Dr. Purple's contribution to the building fund of the Academy marked an era in the struggle of its Ways and Means Committee to secure the money necessary to the pur-

chase of a permanent home. This contribution was made through him by the widow of the late Dr. Alexander E. Hosack and amounted to the sum of $75,000. This money would never have been given to the Academy except through the good offices which he rendered to Dr. and Mrs. Hosack. During one of my latest conversations with him Dr. Purple detailed at length the circumstances attending the negotiations which resulted in the donation of that magnificent sum to the building fund of the Academy. It is sufficient for the purposes of this sketch to state that so intense was Dr. Hosack's antipathy to certain leading members of the Academy when Dr. Purple first approached him on the subject of contributing to the building fund that he resented the suggestion. But Dr. Purple persevered, and by his kindly and friendly interest in Dr. Hosack and his wife so won their confidence that after her husband's death Mrs. Hosack notified Dr. Purple that in compliance with Dr. Hosack's expressed intention and in accordance with her own purpose she was prepared to give the Academy the munificent sum of $75,000. Though there was a considerable building fund at that time it was not sufficient to determine, except prospectively, the certainty of a permanent home for the Academy in the immediate future. It may fairly be claimed that Dr. Purple's contributions to the library and to the building fund were in their results of the nature of foundations.

After his retirement from the presidency of the Academy Dr. Purple devoted himself more exclusively to the task of perfecting his collection of medical, historical, and genealogical literature. His writings, which were very limited, were confined for the most part to notes or short papers on medical and genealogical subjects. He has been for several years collecting medical portraits which he contemplated publishing in quarto form with brief biographical sketches, but he left only the collection without any text. These prints are valuable and ought to be published in the form

which he designed, both for their value and as a fitting tribute to his memory.

During his last few years Dr. Purple lived a very retired life, rarely appearing at the meetings of the Academy or in any society. The first evidence of an approaching termination of his life occurred in 1899, when he had a hæmorrhage into the posterior chamber of the eye, which permanently destroyed its sight. He recognized the significance of this symptom, but looked forward with calm resignation to the inevitable issue. Subsequent to this occurrence it was discovered that he was suffering from Bright's disease in an advanced stage, and the final termination of his life was due to its complications.

Dr. Purple's personality was that of a quiet, reserved gentleman; fastidious in his dress; dignified but affable in his manners; with a kindly benevolent expression of countenance that indicated a genial, happy temperament and an aversion for all forms of contention and controversy. This feature of his character was illustrated in many of the events of his life. A controversy having arisen in the church of which he was a member, he withdrew from it and never joined another. He manifested no interest in the current political events of the country or city, and scrupulously shunned all contact with societies where he might be led into partisanship. The only instance where he manifested any considerable personal feeling was when the issues raised by the discussion of the code of ethics led to divisions in the profession in this State. He was naturally intensely devoted to the traditions of the profession, not from any narrow prejudice, but rather owing to his conception of the dignity and eminence of the senior medical men, who in the early days of the Academy had struggled to organize the profession of the city to resist the progress of charlatanry. In his daily life Dr. Purple was a model of gentleness, kindness, and benevolence. Though never married he maintained

a home, where his mother, brother, and his brother's widow and children lived in the enjoyment of domestic peace and happiness.

MR. PRESIDENT: There will be few more occasions like this in the history of the Academy, for Dr. Purple was nearly the last surviving founder. How can the memory of these pioneers best be perpetuated is a question which should receive the most considerate thought. Your committee on a memorial have been deeply impressed with the belief that testimonials of respect and gratitude for the beneficent work of departed Fellows should have a visible and tangible form which may be seen and read by all men. To this end we have the satisfaction of presenting to the Academy two memorials of our late Fellow and former president.

The first memorial is a bronze tablet, placed at the entrance of the library in Woerrishofer Hall. It seemed to us a peculiarly fitting act on the part of the Academy to place this tablet at the entrance to and exit from the Library where the present and future student might for all time be informed to whom he is largely indebted for the inestimable privilege of being able to perfect his knowledge in every branch of the medical sciences at the very fountains of medical literature. The inscription on the tablet is as follows:

SAMUEL SMITH PURPLE, M.D.

BORN JUNE 24, 1822—DIED SEPTEMBER 29, 1900.
FOUNDER OF THE LIBRARY OF THE
NEW YORK ACADEMY OF MEDICINE
TO WHICH HE GAVE LARGE AND VALUABLE CONTRIBUTIONS.
A PRESIDENT OF THE ACADEMY AND AN EARNEST
AND SUCCESSFUL WORKER IN ITS INTERESTS.
THIS TABLET IS ERECTED TO COMMEMORATE
HIS MANY VIRTUES AND RARE USEFULNESS.

The second memorial is his full-sized portrait for which the Academy is indebted to the generosity of Mrs. Edwin R.

Purple. Everyone will recognize how singularly accurate this painting is in the portraiture of its subject, and how perfect it is in every detail where the highest degree of art is required. It will prove a valuable addition to the growing and already notable collection of portraits of eminent members of the Academy, and as a work of art will compare favorably with the best paintings of Huntington, Rossiter Johnson, and others, which adorn the walls of Hosack Hall. Its intrinsic value, however, to the present and future Academician will be found in its memorial character, for it will ever recall, like a living presence, the example of one who through a long life devoted his energies and substance to the task of endowing the Academy with a permanent home and a reference library unsurpassed in its completeness.

INAUGURAL ADDRESS.

BY DR. ROBERT F. WEIR,

PRESIDENT-ELECT OF THE NEW YORK ACADEMY OF MEDICINE.

Fellows of the Academy of Medicine, Ladies and Gentlemen:

My remarks, I may say at once, will be very brief, for nature has denied me the arts of speech. But my first duty, and a most pleasing one, is to express to the Fellows of the Academy my high and grateful appreciation of the honor they have conferred upon me in electing me to the honorable and responsible position which I now hold.

It is now many years since I became a member of your body, and my fellowship, in 1881, was soon followed by an election to the position of Vice-President, which continued for six years. This I allude to, not only as a matter of pride in the distinction thus given me, though it was conferred not as a recognition of a personal character, but because of my association at that time with one of the most notable steps in advance that the Academy of Medicine up to that period had made—I refer to the merging, which was then accomplished, of the prosperous New York Journal Association with this institution. This change carried me from Presidency of the Journal Association to the Vice-Presidency of the Academy of Medicine, an incident which was a mere detail of the assimilation; but the importance of the junction was far-reaching and most marked. The development of the library department of the Academy, which has now reached such noble proportions, may be said by virtue of this accessibility of nearly all known medical journals to have progressed from that time with accelerated

impetus. Taken with the generous gift of Dr. Purple of his extensive collection of American medical journals and aided subsequently by the untiring and highly successful efforts of Dr. Jacobi, the library has surely and steadily increased in size and utility until it ranks with the foremost in this country.

As I look back on the somewhat dead-and-alive days of the Academy anterior to 1881, it certainly seems that credit and commendation for the subsequent Phœnix-like development of the Academy should be continually given, first of all, to the administration of Dr. Fordyce Barker, who, by his interest, geniality and charm, from 1879 to 1885, attracted large audiences and marked attention to the meetings of the Academy, and who happily carried it through troublous times with exquisite tact and ability. Since that period the presiding officers have conducted the Academy's affairs with prudence and skill, but no allusion to the officers of the past can be made by myself or others without paying a just and particular mention to the labors of Drs. Jacobi and Loomis, who, *par excellence*, have done most for the progress of the Academy. Their zeal in improving the methods and habitat of our institution is too well known for me now to dwell upon, only I must add a special and personal tribute to the wisdom of the action of Dr. Jacobi in inaugurating the division of the members of the Academy into different sections and specializing their work. Dr. Jacobi has reached an age, now publicly announced, when to praise him does not bring any embarrassment to him, hence we can, and all here do, laud him unstintedly for this admirable suggestion which has so much improved the welfare of the Academy. By it an *esprit de corps* has been evolved and a development of true scientific feeling has been produced far beyond anticipation, as is shown by the fact that the meetings of the sections now often draw a larger

audience and exhibit a greater attraction than many of the Academy's stated bimonthly general meetings.

But more than this has, I think, been brought about by this means. A veritable post-graduate instruction has been effected not only by the numerous papers read at the section meetings, but also by the demonstrations of living cases and by specimens of disease, conjoined with the peculiarly active but short discussions that are so frequently started.

It is felt everywhere that the present methods of training and work are different from those of our fathers. It is said of the American in commerce that his creed is formulated in the words, "What has succeeded in the past will *not* succeed in the future," and our newer plans of medical education bear this out not only for the undergraduate, but also for the practising physician, and I should hope in the future that discussion and demonstrations at our stated meetings may usurp much of the time now given to exhaustive and ear-tiring papers, however learned and valuable they may appear when printed in the journals or buried in the transactions.

This overriding of the sections may be considered by some to be an unfortunate feature and unwise in its outcome. I cannot personally speak on this side of the question as well as I can on the advantages of the section meetings. I take it that it is largely a matter of the personal equation and greatly dependent on the man at the helm. All the more do I think this must be largely so in recalling the admirable work that has been done in the stated meetings during the past two years by my immediate predecessor, in whose footsteps I would fain follow, but whose shoes I cannot fill—for the double reason that he has already so largely availed himself of the notables of the profession by the attraction of their presence and the ability of their articles, that there is but little for me to glean; and secondly, and this I admit,

with, I trust, becoming diffidence, that I have not his ability and compelling power or, in the language of the day, "I am not built that way."

I would like to go and do likewise, and shall, however, make the trial. How well, and in what way, two years hence in my retiring address I may more suitably tell you.

It may hardly be proper or commendable at the present time, in the spirit evoked by a new broom, even though of a rare make, that is to say, by a surgical president, the second of its kind in the last thirty-three years, to indicate what might be done in the future, though the temptation might be yielded to in one or two points—for there is a certain charm in being tempted and even in falling—nevertheless, I will venture to expose myself to criticism by asking your attention to a question that many must have heard before this. It is this: Why does not the Academy grow more rapidly? In the last five years, for instance, the yearly number of resident Fellows ranged from 772 to 804—not a rapid growth it will be perceived. It is almost axiomatic that progress goes with youth. It follows naturally, therefore, that we should seek to have a larger admission of the younger members of the profession.

It is conceded by all that at least three years' general practice should still be demanded before admission to our fold is granted, but is it not possible to consider whether other measures cannot be employed to increase our members.

Each year, I am informed, there is a fairly encouraging surplus in the treasury. If not now, soon the question will arise, cannot the number of admissions be profitably and widely increased by diminishing the annual dues now exacted? Many have doubtless heard similar remarks from young physicians, who would make desirable members, but to whose early entrance into the Academy proper the present dues act as a barrier, for they know the library is free to all. It would not take long, I believe, to double the list

of members at half the dues now exacted. This would not only benefit many medical men, but would enhance the value of the Academy itself and render more stable the current finances, now easily affected by death or resignation of a comparatively few members, or this could be effected gradually, the reduction to be applied, say after five years' membership, or the like.

Again a query comes to my mind that I should like to express. It concerns the somewhat uncertain relation that exists between the meetings of the sections and the general Academy. The section meetings are at present held once a month, and they absorb a majority of the material and brains of the Academy, thanks to their working *en masse* and in given lines. The Academy's meetings are held twice a month, and although one of these meetings, by the by-laws, is to be filled by each section once a year, yet it is notorious that the Academy's meetings are often less attractive than the section meetings. In one of the best years there were, for instance, ninety-eight members taking part in the Academy's meetings and two hundred and twenty-two in the section meetings. The reason offered for the latter discrepancy seems plausible—it is that the subjects chosen by the sections for the stated meeting of the Academy either fail to interest the general practitioner, who is often ignored at such times, or that the members of the section have already discussed the proposed subject, or know too much about it and show lukewarmness in the matter. Would it not be wise, therefore, to consider whether the character of the stated meetings should be somewhat changed, or their frequency be diminished to once a month?

I will not be led further into temptation that would probably only expose too much of my ignorance of the Academy's affairs, but those to which I have alluded have been the subject of not a little outside debate by many on the ways of your institution.

You will, however, see from the ingenuousness of my remarks what a neophyte does when he has a chance. Your laws, luckily, do not often give him an opportunity, and besides I shall have learned enough in the course of the next two years to avoid perhaps thrusting again such crude ideas upon you. Let me, therefore, turn to a more elevating theme to which the date of this meeting is pertinent, for it is now the twentieth century—whether the first of the new era . In the long vista of the departed century, with its many and glorious evidences of man's improvement in various directions, medicine stands nobly forth, as it can present its full share of improvements and discoveries, but there are three which it can claim as of the greatest of benefit to the human race:

Anæsthesia from America, which has widened largely the field of surgery.

Antisepsis from Great Britain, which has given us safety, and the Röntgen Rays from Germany, which has rendered the trouble visible.

These are second to none in all that has been the outcome of the nineteenth century—not in the expenditure of man's forces, but in their conservation of life and continuance of man's power.

The services of the science and art of medicine have effected much in the past, and the outcome for the future seems even more brilliant, but now and hereafter, as in the past, medicine presents itself as always the noblest of professions and the most soul-satisfying of pursuits.

HISTORY OF AMERICAN PEDIATRICS BEFORE 1800.

THE WESLEY M. CARPENTER LECTURE, 1901.

BY ABRAHAM JACOBI, M.D., LL.D.

In the following pages I have drawn largely on Francis Rudolph Packard's "History of Medicine in the United States," Philadelphia and London: J. B. Lippincott Company, 1901, and on A. Jacobi's "Treatise on Diphtheria," New York: William Wood & Co., 1880, which has long been out of print. A number of facts I owe to the erudition of my friend, Dr. Ellsworth Eliot, who placed them at my disposal. Other references are credited at their proper places.

The first teratological notice I am acquainted with in our colonial history is as follows:

A female anencephalus was born in Boston, October, 1637. The monster was ornamented within a few months with all sorts of exaggeration, the feet of a kite, etc. Its mother, Mary Dyer, became therefore the subject of displeasure and mistrust. She was moreover suspected of heresy and improper practices; that is why she was condemned and done to death as a Quakeress, June 1st, 1660.

The first case of hereditary syphilis is reported in John Winthrop's "History of New England" (Packard, p. 39).

"There fell out a loathsome disease at Boston, which raised a scandal upon the town and country, though without just cause. One of the town . . . , having gone cooper in a ship into . . . , at his return his wife was infected with Lues Venerea, which appeared thus; being delivered of a child and nothing then appearing, but the midwife a skilful woman, finding the body sound as any other, after her delivery she

had a sore breast, whereupon divers neighbors resorting to her, some of them drew her breast, and others suffered their children to draw her, and others let the child suck them (no such disease being suspected by any), by occasion whereof about sixteen persons, men, women and children, were infected, whereby it came at length to be discovered by such in the town as had skill in physic and surgery, but there was not any in the country who had been practised in that cure. But (see the good providence of God) at that very season there came by accident a young surgeon out of the West Indies who had experience of the right way of the cure of that disease. He took them in hand and through the Lord's blessing recovered them all in a short time. And it was observed that though many did eat and drink and lodge in bed with those who were infected and had sores, etc., yet none took it of them but by copulation or sucking. It was very doubtful how this disease came at first. The magistrate examined the husband and wife, but could find no dishonesty in either, nor any probable occasion how they should take it by any other, (and the husband was found free of it). So it was concluded by some, that the woman was infected by the mixture of many spirits of men and women as drew her breast (for thence it began). But this is a question to be decided by physicians."

The Puritans placed much faith in the efficacy of prayer to relieve their physical as well as moral ills, and I quote two anecdotes from Winthrop, which will serve to show that they believed their prayers to have been directly answered.

In the year 1644 "One of the deacons of Boston Church, Jacob Eliott, (a man of very sincere heart and an humble frame of spirit) had a daughter of eight years of age, who being playing with other children about a cart, the hinder end thereof fell upon the child's head and drove a piece of the skull before it into the brain, so as the brains came out, and seven surgeons (some of the country, very

experienced men, and others of the ships which rode in the harbour) being called together for advice, etc., did all conclude that it was the brains (being about half a spoonful at one time and more at other times), and there was no hope of the child's life except the piece of skull could be drawn out. But one of the ruling elders of the Church an experienced and skillful surgeon, liked not to take that course but applied only plasters to it, and withal earnest prayers were made by the Church to the Lord for it, and in six weeks time it pleased God that the piece of skull consumed, and so came forth, and the child recovered perfectly, nor did it lose the senses at any time."

The second story is as follows:

"One Bumstead, a member of the church, had a child of about the same age (as the one mentioned above), that fell from a gallery in the meeting-house about 18 feet high, and broke the arm and shoulder (and was also committed to the Lord in the prayers of the church, with earnest desires that the place where his people assembled to his worship might not be defiled with blood), and it pleased the Lord also, that this child was soon perfectly recovered."

W. De Loss Love* reports that the people of Plymouth fasted on the 15th of November 1649, on account of an epidemic of chin-cough (=whooping-cough) and "the pockes." Still more fast days were appointed until after the disappearance of the Epidemic there was a thanksgiving's day on the 13th of March, 1650.

John Winthrop, Jr., whom I mentioned above, was the son of the Governor of Massachusetts, of the same name. He became Governor of Connecticut and was among the founders of the Royal Society of Great Britain. A letter directed to him by William Leete, 1658 ("Collections of the historical Society of Massachusetts"), refers to the first case known of conjunctivitis in a young infant. Packard (p. 25) quotes it as follows:

* The Fast and Thanksgiving Days of New England. Packard, p. 42.

"Our youngest childe, about 9 weeks old, ever since it was 3 or 4 dayes old, hath appeared full of red spots or pimples, somewhat like to measles, and seemed allwayes to be bigg, and to hang ouer on the eyebrowes and lids; but now of late the eye lidds have swelled and looked very red, burneing exceedingly, and now at last they are swelled up that the sight is utterly closed in, that he could not see, nor for suerall dayes, nor yet doth, and the verges of the lids, where they close, have a white seame, like the white heads of wheales wherein is matter; it is somewhat extraordinary such as none of our women can tell that they have ever seene the like."

The earliest treatise on a medical subject, published in this country, was a broadside, 12 inches by 17 in size, written by the Reverend Thomas Thacher,* the first minister of the "Old South." The sheet bears date January 21, 1677-8, and was printed and sold by John Foster, Boston. The title is "A Brief Rule To Guide the Common People of New England How to order themselves and theirs in the Small Pocks, or Measels." It was intended to furnish some popular hints in regard to the management of this disease, which was then much more prevalent than now. A second edition of this "Brief Rule" was printed in the year 1702.

He warns against overheating, excessive diaphoresis and weakening diet and medication in the capacity of one who "though no physician" means well with the sick. The term "measels" may to a certain extent mean what it expresses, but at that time morbilli and variola were still considered either thoroughly similar or identical. Morbilli are first mentioned by the Persian physician Rhazes (850-929), together with variola. Both are condited with a vesiculo-pustulous eruption. The former which is the more formidable one is mostly marked by nausea and general malaise, the latter by backache. Avicenna (980-1036) calls morbillus a variola cholerica. Later Arabists such as Bernhard Gordon

* He lived from 1620 to 1678 and was at the same time a clergyman, orientalist, and practitioner in Weymouth and in Boston.

(1305), Johannes Anglicus de Gadesden (1492), and others collected by Dr. Paul Richter in a paper on measles and pemphigus published in Arch. f. Kinderh. Vol. 32, 1901, mention the two diseases in one breath, and attribute to them either equality or similarity. Even Friedrich Hoffmann discusses the resemblance of measles and variola, which, however, may be differentiated during the later stages. According to him morbilli are the most dangerous—"morbilli semper maligni haberi debent."

Measles.

Measles occurred in many places of New England in 1713. According to Noah Webster* it was universal in 1733. A malignant epidemic in Connecticut and elsewhere reigned 1740-1741; it spread over all the Colonies in 1758 and 1759. In 1772. it destroyed from 800 to 900 children of Charleston (Charles-Town) S. C. Philadelphia had its epidemic 1773, and many cases of catarrh without eruption; Salem, Mass., in May, 1783. Thence it overran all New England; New York had it in November, 1778, and Philadelphia afterward. Wide-spread epidemics are reported from 1748 to 1753, 1769, 1788, 1790, 1795, 1796.

Measles was complicated with dysentery and angina 1748–1753, with dysentery and "fevers" 1759, with angina 1769 and 1783, with influenza 1789 and 1790, with angina, "yellow fever" and dysentery 1795 and 1796.

All the symptoms of measles without an eruption were observed by Rush in 1773, 1783, and 1789. Many of these patients would have measles afterward.

Measles and influenza appeared almost simultaneously in all parts of the United States. Variola and other fevers would soon follow. Webster is *convinced* that catarrh, measles, mild variola and whooping-cough are but varieties

* Noah Webster, a brief history of epidemic and pestilential diseases; with the principal phenomena of the physical world, which precede and accompany them, and observations deduced from the facts stated. In two volumes. Hartford. Printed by Hudson & Goodwin, 1799.

of the same disease occasioned by modifications of the same elementary causes. These elementary causes are drought, frosts, earthquakes, volcanic eruptions, meteors, comets*; also destructive invasions of caterpillars. The popular opinion that measles and small-pox never originate in the human constitution, without contagion, is according to Webster (II, p. 60) a "palpable absurdity." "The first cases of these diseases in every epidemic period, are always generated in the human body, without contagion."

"A series of epidemic diseases, measles, influenza, affections of the throat, followed by pestilential fevers, appear generally to commence and date their departure, from some of the great agitations of the elements. This at least has been the case in the four last periods in America, beginning with 1756–57, 1769 and 70, 1782 and 3, 1788 and 9." (II, p. 14.)

II, p. 15. "Slighter eruptions and earthquakes, which are almost annual, seem to have less effort. The fire of the globe is in perpetual motion or action, and to this great agent, philosophers are agreed, are to be ascribed the changes of seasons, and the generation of rain, hail, and snow. Its operations however are not all of them *visible,* nor even *perceptible,* until they appear by their efforts. It is probable that the invisible operations of the electrical fluid produce more effects than those which are seen. . . . Hence catarrh and other epidemics often appear, *before* the visible phenomena of eruptions and earthquakes."

There is "A LETTER, *about a Good Menagement under the Distemper of the* Measles," &c., without a date, or the author's name. It is mentioned by Dr. Josiah Bartlett, on p. 2 of "a Dissertation on the Progress of medical science in

* That is, we are told, why epidemics occur almost simultaneously in America and in Europe; and that throat diseases such as scarlatina anginosa, angina maligna, cynanche trachealis, etc., are among "those epidemics which belong to almost every pestilential period" [Webster II, p. 68]. Every epidemic constitution appears to begin with measles or with influenza. There follow angina, and "pestilential" fever, dysentery, yellow fever, plague.

the Commonwealth of Massachusetts," read at the annual meeting of the Massachusetts Medical Society, June 6, 1810,* who speaks of its being "on the files" of the Massachusetts Historical Society, and leaves it to be inferred that it is in manuscript. Dr. Bartlett says that it was probably written during the latter part of the seventeenth century, and that "it can be viewed in no other light, than as an ancient curiosity." Several writers of medical history have repeated the same statement. The copy of the "Letter" in the possession of the Historical Society is a small four-page, printed sheet, and its full title is "A LETTER, *about a Good Management under the Distemper of the* Measles, *at this time Spreading in the Country...Here Published for the Benefit of the Poor, and such as may want the help of Able Physicians.*"

It bears the marks of having been folded, and in former times might have been spoken of as "on the files." It is signed "*Your Hearty Friend and Servant,*" and immediately below, the words "Cotton Mather, I guess, by the Style" are written in Dr. Jeremy Belknap's handwriting. On the authority of this guess it has been ascribed to Dr. Mather; and in the catalogue of ante-revolutionary publications given in the "Transactions" of the American Antiquarian Society, it has been referred to the year 1713 as the date of its appearance, because at that time measles was very prevalent in Boston. An advertisement, however, in "The Boston Evening Post," November 12, 1739, announces this "Letter"—with its long title given exactly—as "Just published," which would seem to fix the time of its appearance. As Mather died February 13, 1728, it is evident that he could not have written it.

Influenza

The descriptions of epidemics of feverish catarrhs, mostly of short duration but wide extent, with great prostration but

* Boston, Printed by T. B. Wait & Co., 1810.

little cough, that occurred in the years 1647, 1655, 1660, 1697, 1733, 1737, 1747, 1757, 1761, 1767, 1772, 1781, and 1789 permit of no doubt in regard to the nature of the ailment, but the reports do not particularly accentuate the part infants and children played in the epidemics. In 1761 the disease was complicated with "inflammatory fevers" and many cases were fatal. In 1772 the complication was with measles and angina, in 1789 and 1790 with measles.

Influenza, as it appeared in Philadelphia in the autumn of 1789, in the spring of 1790, and the winter of 1791, was described in its relations to children by Benjamin Rush. Perspiration, fever with its objective and subjective symptoms, catarrh of the respiratory organs—occasional occurrence of nausea and vomiting—a few cases of serious diarrhœa—now and then slow and feverish convalescence ("terminated in tedious and dangerous typhus"), and the tendency to relapse are well delineated. During this epidemic Rush inoculated twenty children with variola, as was the practice before Jenner's time, and observed that never before influenza had an equally favorable course.*

Scarlet Fever.

An epidemic of scarlatina reigned in Philadelphia, Pa., and in Salem, Mass., in and after September, 1783, in Charleston, S. C., in Vermont, in New Hampshire, and in

* In my paper on the "Treatment of Influenza in Children" [*The Medical News*, Dec. 15th, 1900], I referred to Goldschmidt who wrote in the *Berlin. Klin. Woch.* of 1890 and 1891 on immunity through vaccination. He reports: "About new year 1890 a lady suffering from influenza landed in Madeira and disseminated the disease in a short time. Two months previously there had been an epidemic of small-pox, and numerous vaccinations and revaccinations had been performed. Now it so happened that all those who were successfully vaccinated—112 all told—remained free of influenza. Of 98 who were vaccinated unsuccessfully, 15 took sick." The author concludes from his experience that successful vaccination is a prevention against influenza. That experience of Goldschmidt's suggests the possibility of a future sero-therapy for influenza and its very serious consequences.

In the discussion following the reading of my paper Dr. Holbrook Curtis referred to the internal use of vaccine virus by himself and others.

Connecticut, 1784. These epidemics lasted five years. It broke out again, 1789-91 in Philadelphia and parts of New Jersey, and in 1792-93-94 in all the Northern States.

During the years 1789 and 1791 it was mild. Sporadic cases were always observed. "Scarcely a year passes" says Webster, "in which sporadic cases of scarlatina, or anginas of other kinds do not appear in particular places; but they never spread without some uncommon concurrence of causes." In his opinion the disease is not contagious (he uses the word "infectious"), its dissemination depends on the extent and power of the "pestilential principle."

The New York epidemic of 1793 was very malignant, and was complicated with angina.

The scarcity of direct material referring to our subject will justify a communication from a foreign source. George Lord Bishop of Cloyne reports on the use, evidently quite common in America, of tar water in infectious diseases, in a book which carries the title:

SIRIS:
A CHAIN OF
Philosophical Reflexions
AND
INQUIRIES,
Concerning the VIRTUES of
TAR WATER,
And divers other Subjects connected together
and arising one from another.
By G. L. B. O. C.
As we have opportunity let us do good unto all men.
Gal. vi. 10.
Hoc opus, hoc studium parvi properemus et ampli.
Hor.
DUBLIN:
Printed by MARGT. RHAMES,
For R. GUNNE, Bookseller in Capel-street,
MDCCXLIV.

He says:

"1. In certain parts of America, Tar water is made by putting a quart of cold water to a quart of tar, and stirring them well together in a vessel, which is left standing till the tar sinks to the bottom. A glass of clear water being poured off for a draught is replaced by the same quantity of fresh water, the vessel being shaken and left to stand as before. And this is repeated for every glass; so long as the tar continues to impregnate the water sufficiently, which will appear by the smell and taste. But as this method produced tar water of different degrees of strength, I chose to make it in the following manner. Pour a gallon of cold water on a quart of tar, and stir and mix thoroughly with a ladle or flat stick for the space of three or four minutes, after which the vessel must stand eight and forty hours that the tar may have time to subside, when the clear water is to be poured off and kept for use, no more being made from the same tar, which may still serve for common purposes.

"2. This cold infusion of tar has been used in some of our colonies, as a preservative or preparative against the small-pox, which foreign practice induced me to try it in my own neighbourhood, when the small-pox raged with great violence. And the trial fully answered my expectation: all those, within my knowledge, who took the tar water having either escaped that distemper, or had it very favourably. In one family there was a remarkable instance of seven children, who came all very well through the small-pox, except one young child which could not be brought to drink tar water as the rest had done."

Diphtheria.

In the New England States diphtheria ("cynanche trachealis") has appeared in the seventeenth century. Samuel Danforth, graduate of Harvard University, in 1643, had twelve children. The "next three being attacked by the

'malady of bladders in the windpipe,' in December 1659, it pleased God to take them all away at once, even in one fortnight's time." This happened at Roxbury, Mass. ("Biographical Sketches of Graduates of Harvard University, etc." By John Langdon Sibley, Vol. I., Cambridge, 1873, p. 91.)

When the epidemic ceased in 1662 the legislature of Connecticut appointed a thanksgiving day.

This epidemic is undoubtedly that which was described by Captain Morton, of the Plymouth Colony, in his New England memorial. He is quoted by Wm. Douglass as having mentioned, not described, a mouth and throat disease which reigned 1650 and proved fatal, in a short time, in many cases.

John Josselyn, Gent., in "an account of two voyages to New England, made during the years 1638, 1663," 1674* (Boston, Wm. Veazie, 1865), writes as follows (p. 141): "also they" [the English in New England] "are troubled with a disease in the mouth or throat, which hath proved mortal to some in a very short time, quinsies and impostumations of the almonds, with great distempers of cold." As Josselyn on his second voyage spent eight years in New England (principally in Maine), the foregoing must point to an epoch not later than 1671, and the manner in which he expresses himself shows that he does not speak of a recent invasion, but of a disease which had been common for some time. I have no proofs of epidemics during the following decades, but the year 1735 marks the recurrence of epidemics. In a "Compendious History of New England," by Dr. Jedediah Morse, D.D., and Red. Elijah Parish, Charlestown, 1804, we read with reference to the epidemic of 1735, that the throat became swollen and coated with white and ash-gray spots, an eruption appeared on the skin; great debility overcame the entire body, with a marked tendency to putrid-

* Reprinted 1833 in the Publications of the Mass. Histor. Society, 3 series, 3 vol.

ity. The disease first appeared in 1735, at Kingston, N. H. Wm. Douglass, M.D. ("The Practical History of a new epidemical Eruptive Miliary Fever with an angina ulcusculosa, which prevailed in Boston, New England, in the years 1735 and 1736, Boston N. E. Printed and Told by Thomas Fleet, at the Sign of the Heart and Crown in Cornhill 1736") says of this epidemic: "It was first noticed in Kingston township, on the 20th of March, 1735, about fifty miles eastward of Boston. As this was an inland place of no considerable trade or importance, it was thought (incorrectly perhaps) to be of indigenous origin, and not of foreign importation. The first victim was a child who died in three days; and about a week after three children were seized in another family four miles distant; and they also died on the third day. It continued spreading gradually, seizing here and there particular families, with that degree of violence that of the first forty cases none recovered. Some of the patients died of a sudden acute necrosis, or mortification; but most of them were carried off by a sympathetic affection of the fauces, neck or air-passages; or, by an infiltration and tumefaction of the chops, and forepart of the neck, which became so enlarged and turgid, as to bring upon a level all parts lying between the chin and sternum, occasioning a strangulation of the patient in a very short time. After a few weeks it spread from Kingston to the neighboring townships, but in a milder form. No reasons could be given for this greater malignity in Kingston, except, perhaps, the prevalence of damp places near large ponds, and fresh water, but sluggish streams, like in those localities which produce the rot in sheep. There may also have been bad medical treatment. Its first recognized appearance in Boston was on the 20th of August 1735, in a child .... who had white specks in the throat, and a cutaneous efflorescence. A few more... were seized in like manner. Towards the end of September it appeared in several parts of the town of Boston, with more decided complaint of soreness of the throat.

The tonsils were swelled and specked; the uvula was relaxed; there was slight fever, and an erysipelas or scarlet fever like efflorescence on the neck, chest, and extremities. The first alarming case was in the beginning of October, in a young man. He had lately arrived from Exeter, to the eastward of Boston, where his brother had died of the same illness. His symptoms were great prostration of strength, a single speck on one of his tonsils, and colliquative sweats . . . It increased during the winter up to the second week in March, 1736; when it was at its height, there being twenty-four burials in all, during the week (instead of nine or ten) . . . The disease was so much milder in Boston than in some of the townships where it first prevailed that many could not be persuaded that it was the same disorder . . . To the eastward of Boston, at times, one in three died, in other places one in four, and in scarce any towns, less than one in six; whereas in Boston not above one in thirty-five succumbed."*

Though the mortality was not great, the select men of Boston issued a proclamation. Green† quotes it from *The Boston Weekly News-Letter* for April 29, 1736:

"The *Select-Men of the Town of Boston,* in order to inform the Trading Part of our neighbouring *Colonies,* concerning the state of the present *prevailing Distemper* in this Place, did desire a Meeting of as many of the *Practitioners in Physick* as could then be conveniently obtained. The

* The same author also mentions a slight fever with vesicular eruptions that disappeared, unless prolonged by "cold," in two or three days. The throat was not complained of, and there were no deaths. But there were also many inflammations of the throat and ulcerations with swelling of the throat, of "scropulons, scorbutic, or psoric origin." Vesicatory blishers became gangrenous, the fever was high, and many patients died. What we now know would justify in diagnosticating these cases as belonging to the epidemic of his angina maligna ulcusculosa.

† History of Medicine in Massachusetts, by Samuel Abbott Green, M.D., a centennial address delivered in the Sander's Theatre, at Cambridge, June 7, 1881, before the Massachusetts Medical Society, Groton, 1881.

Practitioners being accordingly met, did unanimously agree to the following Articles:

1. That upon the first appearance of this *Illness* in *Boston* the *Select-Men* did advise with the *Practitioners;* but they at that time having not had opportunities of observing the Progress of the *Distemper,* it was thought advisable (until further Experience) to shut up that *Person* who was supposed to have received it in *Exeter* to the Eastward, upon his Death the Watch was soon removed, but no Infection was observed to spread or catch in that Quarter of the Town; therefore no Watches were appointed in the other Parts of the Town where it afterwards appeared, the Practitioners judging it to proceed from some *occult Quality in the Air,* and not from any observable *Infection communicated by Persons or Goods.*

2. *The* Practitioners and their Families have not been seized with this Distemper in a more *remarkable* manner (and as it has happened not so much) than other Families in Town, even than those Families who live in solitary Parts thereof.

3. *As* to the Mortality or Malignity of this Distemper, all whom it may concern are referred to the Boston Weekly Journal of *Burials;* by the Burials it is notorious, that scarce any Distemper, even the most favourable which has at any Time prevailed so generally, has produced fewer Deaths.

4. *As* formerly, so now again after many Months Observation, we conclude, That the present prevailing Distemper appears to us to *proceed from some Affection of the Air, and not from any personal Infection received from the Sicl or Goods in their neighbourhood.*

"NATHANIEL WILLIAMS.
WILLIAM DOUGLASS.
JOHN CUTLER.
HUGH KENNEDY.
WILLIAM DAVIS.
THOMAS BULFINCH."

The disease was commonly known as the "Throat Distemper," and according to Webster,* this epidemic began, as has been stated before, in the town of Kingston, New Hampshire. Three months after its first appearance in that town the disease appeared at Exeter, six miles distant, and one month later had become prevalent in Boston. The epidemic extended its area, and gradually the disease broke out in Connecticut, New York, and New Jersey.

Wickes† quotes two notices regarding this outbreak from *Zenger's Weekly*, of New York. The first is dated February 9, 1735-36:

"Throat Distemper: We are informed that at Crosswicks in West Jersey, divers persons have lately died with a Distemper in the throat, and that Distemper prevails there. We are therefore desired to publish the following remedy (which has proved successful) for the advantage of those who may hereafter be visited with the like Distemper: Take some Honey and the sharpest Vinegar with Allum dissolved therein, and let the patients often gargle it in their throats; or if they be children, then take a feather and dip it in said liquor, and so wash their throats."

At that time the following pamphlet appeared first:

Two SERMONS,
On Occasion of the
Fatal Distemper.
Which prevail'd in sundry Towns within
the Province of *New-Hampshire.*
By JABEZ FITCH,
Hos. 6. I.
Come and let us return unto the Lord, for He hath torn, and He will heal us; He hath smitten, and he will bind us up.
BOSTON:
Printed for ELEAZER RUSSEL in *Portsmouth.*
1736.

* Epidemics and Pestilential Diseases.
† History of Medicine in New Jersey.

"The brief Sermons here emitted, were preached last Winter, on Occasion of the fatal Distemper in the Throat, that then prevailed in sundry Towns, and that Distemper having since spread into other Parts, and it remaining still in some measure where it first began; I thought that the publishing of these plain Discourses (such as they are) might possibly be useful to some Persons under their present distressing Circumstances, and might serve to keep up the Memory of that awful Calamity which ought never to be forgotten and excite us to a due Improvement thereof: That these good Ends may be attained, is my hearty Prayer.

"Portsmouth, August 13, 1736. JABEZ FITCH."

Second:

Advertisement.

Just Published,

An Account of the Numbers that have died of the Distemper in the Throat, *within the Province* New-Hampshire, *with some reflections thereon...Sold by* Eleazer Russel *in* Portsmouth, *and* Daniel *Henchman* in *Boston.*

Dr. Thacher, in his account of Douglass in the "*American Medical Biography*,"* calls it *angina maligna* which is a generic term, and includes any inflammatory affection of the throat or fauces, such as quinsy, malignant sore-throat, croup, or mumps. It has been considered also to be scarlatine; but the description leaves but little doubt in my mind that the diagnosis at the present time would be diphtheria. Dr. Douglass's essay was republished in the *New England Journal of Medicine and Surgery* (Boston, 1825), with an editorial note that "it has been pronounced by competent

* American Medical Biography: or memors of Eminent physicians who have Flourished in America. To which is prefered a succinct history of Medical Science in the United States from the first Sixternal of the Country. By James Thacher M.D. Two Volumes in Ch. Boston, Richardson & Lord and Coltons & Barnard, 1828.

judges one of the best works extent upon the subject of which it treats." (XIV. 1-13.)

The disease cannot have remained so mild for any length of time in Boston, for on August 5th, 1740, the preface to the letter of I. Dickinson, A.M., dated at Cambridge, speaks of the "most malignant disease which had raged for a long time in the place where he lives, and which had commenced its fatal progress in these parts," and of the "fresh alarm by a return of that astonishing distemper among us." The letter was written in 1738, and published two years afterward, under the title of: "Observations on that terrible disease, vulgarly called the Throat Distemper, with advices as to the method of cure, in a letter to a friend. By I. Dickinson, A.M. Boston. Printed and sold by S. Kneeland and T. Green, in Queen Street, over against the Prison. 1740."

The clergyman to whose observations and industry we owe this short letter appears to have seen most of the forms of diphtheria. He describes cases which:

1. "Begin with a shivering, a chill, or with stretching or yawning, which is quickly succeeded with a sore throat, a tumefaction of the tonsils, uvula and epiglottis, and sometimes of the jaws, and even of the whole throat and neck. From the second to the fourth day there may be a miliary eruption, in some exactly resembling the measles, in others more like the scarlet fever, in others like the confluent small-pox." This form proved fatal but seldom.

2. "It frequently begins with a slight indisposition, much resembling an ordinary cold, with a listless habit, a slow and scarce discernible fever, some soreness of the throat and tumefaction of the tonsils; and perhaps a running of the nose, the countenance pale, and the eyes dull and heavy. Sometimes vehement sickness of the stomach, a perpetual vomiting; and sometimes by ejecting of black or rusty and fetid matter, having scales like bran mixed with it, which is a certain index of a fatal mortification. When the lungs are thus affected,

the patient is first afflicted with a dry, hollow cough, which is quickly succeeded with an extraordinary hoarseness, and total loss of the voice, with the most distressing asthmatic symptoms and difficulty of breathing, under which the poor miserable creature struggles, until released by a perfect suffocation, or stoppage of the breath... Comparatively few recovered... Some expectorated incredible quantities of a tough whitish slough from their lungs... I have seen large pieces of this crust, several inches long and near an inch broad, torn from the lungs by the vehemence of the cough."

3. It sometimes appears in the form of an erysipelas, in some with all the terrible symptoms above described, in some with none of them.

4. In external ulcers all over the body.

5. In glandular swellings with favorable result only when they undergo suppuration, and lastly as sudden orthopnœa, which proves fatal in from one to three days. It shows its peculiar character by the presence of the "crustula in the throat, which determines it to be a sprout from the same root with the symptoms described above."

The treatment of the Reverend is a singularly rational one; moderate temperature, disinfectant applications, warm poultices to swollen glands, but moderate purgation, and mild stimulants, all of them in the compound mixtures of his time, form his armentarium. He adds that there is no security against a second attack; he has seen it four times in a patient in one year, the last proving fatal, and known numbers that have passed through it in the eruptive form in the summer season, "that have died with it the succeeding fall or winter, though I have never seen any one upon whom the eruptions could be brought out more than once."

From the diary of David Hall, D.D., April 6, 1741, I take the following:

"Nineteen persons have died with the lung fever: many more of the throat distemper; no less than five in one family.

God's hand is upon old and young, especially upon my people." This is found on p. 59 of History of the Town of Sutton, Massachusetts, from 1704 to 1876, including Grafton until 1735; Millbury until 1813; and parts of Northbridge, Upton and Auburn, compiled by Rev. William Benedict A.M. and Rev. Heram a Tracy, Worcester (Mass.), 1878.*

According to Dr. Cadwalader Colden, in a letter written 1753 to Dr. Fothergill† (printed in vol. 1st of the London Med. Observations and Inquiries, pp. 211-225), the "throat distemper" spread from Kingston gradually westward, so that it did not reach the Hudson River until nearly two years afterward. It continued some time on the east side of the river, before it passed to the west, and appeared first in those places to which the people of New England chiefly resorted for trade, and in places through which they travelled. It continued to move westerly, till it probably spread over all the British Colonies on the continent. Dr. Colden's description resembles that of Dr. Douglass. A few of the points emphasized by him are the following: Though the disease was evidently propagated by contagion, yet children and young people only were subject to it, with the exception of a few. A very few aged people who were taken died. It did not spread equally to all places that were proportionately exposed to the infection. The poorer sort of people were more liable to it, and they who lived on low and wet grounds and on poor scorbutic diet. In some places, only a few persons or families were seized; while in others all escaped. In some families it passed like a plague through all their chil-

* In a letter from Dr. Ellsworth Eliot, to whose watchfulness I owe this reference, he adds: "The town of Sutton is 42 miles South West from Boston."

† John Fothergill of London wrote, 1748, "An account of the sore throat attended with ulcers; a disease which hath of late years appeared in this City, and the parts adjacent." London, printed for C. Davis, over-against Gray's Jungate, Holbourn MDCCXLVIII on p. 61 he says: "a cordial, alexipharmac, warm Regimen has been found by Experience to be of the most use in such Cases; and Bleeding, Turging. Antiphlogistics, liberally employed, either retard, or wholly prevent these Discharges."

dren; in others, only one or two were seized. Some were attacked at a great distance. Some had it mildly, while others in the same place and at the same time had it most violently... "Many have not been confined to their beds, but have walked about the room, till within an hour or two of their death. And the complaint has often appeared in no way dangerous, at first, to the attendants, till the sick were almost in the last agonies, though the patients themselves are generally dejected and apprehensive. When the surfaces of the tonsils, after the sloughs were cast off, appeared of a very fiery-red color, there was some, or even greater danger; but when they were covered with a black crust it was often a fatal omen, as also where hæmorrhages followed any slight scratch... When the disease first appeared, it was treated in the usual way for a common angina, and no plague was more destructive... The orifices made by the lancet in bleeding, and the adjacent parts were apt to become diseased. So likewise the places where blisters were applied. The ichor which issued from them corroded the parts upon which it flowed, and even slight scratches became as it were mortified... A girl about ten years of age, while the throat distemper was prevailing, had sores on her private parts like those on the tonsils of others, but no symptom of the disorder appeared in her throat."

A letter dated Philadelphia, June 16th, 1769, "To the Editor of the American Magazine," with the title: Observations on the angina maligna or the putrid and ulcerous sore throat with a method of treating it. By a lover of Pennsylvania, Philadelphia. Printed by William and Thomas Bradform at the London Coffee-House MDCCLXIX.," refers to the epidemic which prevailed during and since 1746 amongst children up to the age of puberty. The main symptoms were those of oppression, faintness, drowsiness, and general putridity with a full, or quick, or sining pulse. The author declares the disease as "almost pestilential." No attempt should be

made at abating inflammation by bleeding and purging. "Emetics" are better. The primæ viæ must be cleansed and the powers of life should be supported by diaphoretics, and subacid and camphorated cordials. Antiseptics should be given such as back or back with rhabarbe, also a few grains of calomel. Blisters should be avoided in the beginning, but toward convalescence act as stimulants. Of an infusion of gum myrrh in 16 parts of vinegar a teaspoonful is given in barley water. Externally warm vinegar is used, and hot steams of vinegar with stimulating herbs are employed for inhalation mainly in the gangrenous cases.

The letter is attributed to Benjamin Rush.

The wide-spread epidemic does not appear to have abated much after this time. For, in his first letter to Mr. Hugh Gaine, of New York, dated Jamaica, Long Island, in the Province of New York, Oct. 28th, 1769 (reprinted in the "Medical Repository and Review of American Publications on Medicine, Surgery, and the Auxiliary Branches of Philosophy. Conducted by Samuel L. Mitchill and J. R. S. E. and Edward Miller M.D.," Vol. V., New York, 1802, p. 97), Dr. Jacob Ogden* refers to the "distressed condition of the people in Boston and Oxford, occasioned by the fatal effects of the malignant sore throat distemper." He also refers to the prevalence of the disease in his neighborhood. The symptomatology contained in his second letter, dated Jamaica, Sept. 14th, 1774 (reprinted Med. Repos., V. 1801, p. 101), contains briefly, a recapitulation of the excellent description, mainly of the milder forms, as given by Douglass, while the first is given up to treatment alone. Calomel ("incredible quantity of Mercury") and a compound mixture containing Seneka (Polygala s.) are highly recommended. Seneka was, credit not being given, claimed as the sufficient remedy in diphtheria "without any other medicine—the use of mercury may, however, sometimes, as in the symptomatic

* Printed in an almanac "second fall month Ortobo" 1674.

kind, be necessary"—by John Archer, Jr., in "an inaugural dissertation on cynanche trachealis, commonly called croup or hives," Philadelphia, 1798, p. 46, and "on the use of the Radix Seneka in the cure of Croup. Letter to B. S. Barton, M.D." Med. Repos., I., p. 120, 1798, and II., 1799, p. 27. In connection with the above, a few sentences will be of interest as showing the tendency to disinfecting treatment on the part of the old practitioner (Ogden).* "Detergent gargarisms, or injections, are of service when the patient is of an age capable of using them. The air of the room where the sick lie might also with advantage be continually impregnated with the steam of vinegar. Sea-coal might be burnt in the winter instead of other fuel; and, in the summer, the room might be fumigated with myrrh, rosin, and sulphur, strewed on burning coal often in a day. These fumes, if diligently persisted in, would, it is more than probable, not only much benefit the sick, but be the best means of preventing the infection from spreading in the family." (Med. Repos., V., 1802, p. 103.)

Samuel Bard's brilliant little book appeared under the following title: "An Enquiry into the Nature Cause and Cure of the angina suffocation, or, throat distemper, as it is commonly called by the Inhabitants of this City and Colony. By Samuel Bard M.D. and Professor of Medicine in Kings College New York.

Is recte curaturus quem prima origo causae non fefellerit. Celsus.

New York. Printed by S. Inslee, and A. Tar, at the New Printing Office in Beaver Street MDCCLXXI."

Bard's article is among the calmest, wisest, and most accurate that has ever been written on diphtheria, both before and since his time.† While his style is classical in its simplicity, his observation is astonishingly correct, and his con-

* He died fifty-nine years old, 1780.

† John C. Peters in "West Virginia Med. Stud.," Aug., 1876.

clusions as to the actual identity of all the diphtheritic processes in the most various clinical symptoms unimpeachable this very day. His description of the various forms of pharyngeal diphtheria is painfully good, his observations on cutaneous diphtheria very accurate, his few dissections well recorded, particularly when he speaks of tracheal and tracheolaryngeal diphtheria, and his historical reviews very judicious indeed. "Upon the whole, I am led to conclude that the morbus strangulatorius of the Italians, the croup of Dr. Home, the malignant ulcerous sore-throat of Huxham and Fothergill, and the disease I have described, by Dr. Douglass, of Boston, however they may differ in symptoms, do all bear an essential affinity and relation to each other; or are apt to run into each other, and, in fact, arise from the same leven. The disease I have described appeared evidently to be of an infectious nature, and being drawn in by the breath of a healthy child, irritated the glands of the throat and windpipe. The infection did not seem to depend so much on any prevailing disposition of the air, as upon effluvia received from the breath of infected persons. This will account why the disorder sometimes went through a whole family, and yet did not affect the next-door neighbors. Here we learn a useful lesson, viz.: to remove young children as soon as any one of them is taken with the disease, by which many lives have been saved and may again be preserved."

The influence which he might have exercised in shaping the professional opinion on the nature of the disease did not make itself felt, partly because of the classical modesty of the New York physician, and partly because of his remoteness from the centres of European learning.

Chalmer* observed a complication of diphtheria with measles and scarlatina in South Carolina. Evidently the character of this epidemic was very malignant, for chills, fœtor from mouth and nose, extensive membranes, cutaneous

* In a book to be quoted below.

diphtheria before and during desquamation, large lymphoïde swellings, gangrene, delirium, and frequent deaths were observed. It appears that antiphlogistic treatment was soon given up. Purgatives and vesicatories were recommended, and antiseptic treatments became necessary.

"A letter from Peter Middleton, M.D., to Mr. Richard Bailey on the croup," dated New York, Nov. 20th, 1780, which had become absolutely rare for some time, and was reprinted, therefore, in the *Med. Repos.*, Third Hexade, Vol. II., N. Y., 1811, p. 347, contains Dr. Middleton's views on the nature of the prevailing illness. He was a Scotchman, who emigrated to the colony in 1752, and coincided with Home's views on croup. He insists upon having met with local membranous croup only, though he does not "presume to say that it never is complicated with the malignant sore-throat," and asserts to have been very successful with jugular venesections, blisters over the throat and evacuants. He reports cases and autopsies observed since 1752.

Home* tried to draw a distinct line between the pseudo-membraneous and the gangrenous affections, and endeavored, to his utmost, to convince his colleagues that croup and angina maligna were two distinct diseases, notwithstanding all that had been uttered since the time of Aretaeus to prove

* An inquiry into the Nature, Cause, and Cure of the Croup. By Francis Home M.D. His Majesty's Physician, and Fellow of the Royal College of Physicians in Edinburgh. Edinburgh, Printed for A. Vincaid and J. Bell, MDCCLXV. [Price one shilling.]

On p. 59 he says:

"To effectuate a solution of the morbid membrane, after it is once completely formed and consolidated, seems to me impossible by any internal or external medicine that I know. To effectuate its expulsion appears equally impossible. We have then, no method remaining to save the patient's life, but that of extraction. That cannot be done thro' the *glottis*. When the case is desperate, may we not try *bronchotomy?* I can see no weighty objection to that operation, as the membrane can be so easily got at, and is very loose. Many a more hazardous operation is daily performed. I would propose however, that it should be first tried on a dead subject, that we may proceed with all manner of contained assistance. But something ought to be tried in their dangerous situation."

their identity. No matter, however, in what way he tried to explain the false membranes—he looked upon them as aggregations of mucus—he found them, and gave an accurate description thereof. He sought for it exclusively in the respiratory tract, and disregarded any connection between it and the false membrane found in the pharynx. From the facts known to him his reasoning was conclusive, and the appreciation of the danger connected with the morbid process and his remedial suggestions are very creditable.

Dr. Richard Bailey's letter to Dr. William Hunter,* of London, written and published about the year 1781, shared the fate of Dr. Middleton's pamphlet. It got scarce, and at last lost, so that only a part of it could be reproduced in the *Med. Repos.* of 1809, Second Hexade, Vol. VI., p. 331, while the then lost part was supplied in that of 1811, Third Hexade, Vol. II., p. 345. While Dr. Middleton denies having seen the throat distemper with his cases of croup, Dr. Bailey describes the same class of cases with the exact symptoms of pharyngeal diphtheria. The main symptoms were, however, with him also those of local obstruction and suffocation, of "angina trachealis." He considers it as "an inflammatory disease, the treatment of which must vary in every degree according to its violence; and though the common antiphlogistic treatment will in some cases relieve, if early applied, yet the most desperate may yield to repeated bleedings *ad deliquium* from the jugulars, the free use of tartar emetic and other evacuants, with a large blister covering the larynx and aspera arteria, while the mucus filling up the ramifications of the bronchia may be emptied by the action of vomiting."

* "Cases of Angina Trachealis, with the Mode of Cure, in a letter to William Hunter M.D. etc., by Richard Bailey, Surgeon. To which is added, a letter from Peter Middleton M. D., to the author,

Si quid novisti rectius istis
Candidus imperti; si non, his utere mecum
Hor. Epist."

New York 1781. Printed by H. Gaine, in Hanover-Square MDCCLXXXI.

Toward the end of the century, Noah Webster reports epidemics of measles and malignant angina which spread simultaneously over all the colonies. Almost all the children that were taken died; many of them of strangulation. This epidemic was followed by one of dysentery which would often destroy the sick on the third day. It was worst in Connecticut (New Haven and East Haven) and in Massachusetts (Salem).

He also tells the story of an elderly lady in New Haven, from whom he learned that those who recovered of the throat distemper, suffered from throat disease all their lives, and that few of them lived to an old age. A gentleman who lived in 1799 when Webster wrote, informed him that he never recovered entirely.

One of the last productions of the eighteenth century is a book of 69 pages by Charles Caldwell. It is entitled: *An attempt to establish the Original Sameness of Three Phenomena of Fever (principally confined to infants and children) described by medical writers under the several Names of Hydrocephalus internus, Cynanche Trachealis and Diarrhea Infantum. By Charles Caldwell, Fellow of the College of Physicians of Philadelphia etc. Philadelphia, Printed by Thomas Dobson, at the Stone-House, no. 41, Seventy Second Street* 1796. The author's theory and practice are completely influenced by Brownianism which was little thought of in the country where it originated (Great Britain), more in Germany, and very much, for a brief period, in America. The three diseases named on the title-page are considered as "the genuine and destructive offspring of arterial action, morbid in its nature, excessive in its violence, and by causes of peculiar tendency determined to the encephalon, the trachea, or the intestines."

The alleged foundations of his theory are as follows:

1. All those diseases are originally general, and not local.
2. In all his cases a general fever was the first symptom.

3. They are principally met amongst children of the same age and of similar constitution, in the same seasons, in the same situations, and appear to be brought on by the operation of the same remote and exciting causes.

4. These diseases appear to be capable of reciproxe alternation.

5. The morbid processes by which these local diseases are immediately effected are doubtless of a nature truly evacuant. All evacuations evidently produce on the system effects unequivocally sedative, but all sedatives certainly operate to the prevention or removal, and never to the production of general fever.

6. No morbid and preternatural discharge of any fluid from small vessels of the system is of long and dangerous duration, unless such discharge be kept up by the impetus of the blood subjected to a certain degree of febrile action.

7. The treatment of the three diseases is the same and yields the same result.

The indications for treatment are

1. to avoid external and internal irritation,

2. to diminish the internal irritants to whose effect the organism is always subject.

The treatment therefore consists in rest, cool temperature, mild diet, acidulated beverages—bleeding once or more, purgatives, diaphoretics, diuretics, and sialogoques. The last evacuant, according to Caldwell, is cold; it diminishes the heat of fever.

The membrane Caldwell describes in these words:

(p. 39) "Whether the preternatural membrane be produced by the immediate action of the mucus follicles of the part ('the aspera arteria' = trachea), or by minute arterial extracties which, during health, exhale a more attenuated fluid, is a controversial point on which I do not mean to hazard an opinion."

The pamphlet is written with great self-sufficiency and

arrogance, and contains fierce attacks on Benjamin Rush. I have quoted extensively so that you may have an opportunity to congratulate *American Medical* literature upon not having suffered more extensively from the domineering influence of theories not supported by solid facts. The history of German medicine in the first forty years of the nineteenth century exhibits the baneful influence of metaphysical and merely theoretical reasoning, of which Anglo-Saxon Medicine remained comparatively free. Caldwell's production yet is very near the danger lines. It is full of wilful assertions and undigested notions.

Pediatrics is well represented in

AN
ACCOUNT
OF THE
WEATHER AND DISEASES
OF
SOUTH-CAROLINA.
By LIONEL CHALMERS, M.D.
Of Charles-Town. South-Carolina.
In two volumes.
Vol. I.
LONDON:
Printed for EDWARD and CHARLES DILLY.
MDCCLXXVI.

and extracts are here given from several chapters of the book.

Of the disorders to which children are liable at this season, pp. 57—66.

Though hot weather weakens us, it cannot be called the cause of the diseases which appear in summer. Children exhaust themselves more by exertion and expose themselves more than adults; digestion being impaired acidity abounds in the first passages; unless that be expelled, the acid acrimony will bring on diseases. Children should be taught to feed early, before they are weaned, lest they suffer when the

breast is taken from them; they should be fed with food most easily digested. When the stools are large and watery all purgatives must be abstained from, but rhubarb, crab's eyes or calcined hartshorn may be given. Vomiting should not be resorted to when the patient is weak; applications of cantharides are useful.

Of worms in children, pp. 66—71.

All weakly people may be liable to worms, but under 14 scarcely any are free from them; they are sometimes so numerous that they soon devour what is eaten and the patient has a voracious appetite though eating much. The best vermifuge is Indian pink, lonicera, but it must be used carefully to prevent drowsiness and loss of sight with convulsions at times. Serpentaria, wine, volatiles are its corrective, followed by crab's eyes. Some prescriptions are here given. Have found lonicera, rhubarb and calomel very effectual against tenia; a negro passed 60 ft. of one of these in a week with this medicine. The seeds of chenopodium are also very good for worms.

Of convulsions in children, pp. 75—80.

When the belly is bound in children in fevers they are in danger of convulsions which do not frequently happen unless the first passages abound with acrimonious humors or flatulencys. Children with wide heads or broad foreheads are most liable to these disorders. When convulsions come on they should be bled and vomited freely, but for this a powerful emetic is generally necessary; ipecac, antimony or mercury can be used. A diarrhea should also be brought on by clysters; volatiles may be given through the nose; frictions should likewise be used, more active clysters be given, blistering plasters applied; put patient to waist in warm water, with active laxative mixtures if the case is severe.

Of the thrush, pp. 91—96.

Though the thrush is most common with infant, others are not exempt from it, especially the elderly. I have never ob-

served this disease except when an abounding acid could be traced which, having passed into the circulating medium, tainted this with that acrimony. In infants the thrush is always preceded by green, pale, curdled or frothy stools which are more or less acrimonious. In infants I use emetics to clear the stomach, with rhubarb, magnesia or crab's eyes. Rubbing off the aphthae should be forbidden; after purging the diet should be alkaline; Oporto wine may be used for a gargarism with oak bark, a little alum or spirit of vitriol.

Of the runnings from behind the ears of children, and other cutaneous disorders, pp. 96—98.

Though spreading deep ulcerations should be prevented, yet the discharges from behind the ears should not be hastily dried up. 20—30 gr white precipitate made into an ointment with 6—8 drams of axungia porci will soon cure these superficial ulcerations as well as the runnings behind the ears. In both cases some alkaline purges should be given at the distance of 3—4 days between each dose. 2 drachms of strong mercurial ointment mixed with the above liniment will cause the tinea to distemper when rubbed on every morning, but issues should be made in the arms and purgings for 1—2 weeks or the disease may return. A man told me that he had been cured by powdered tobacco leaves mixed with hog's lard.

Of the suffocation of catarrhal peripneumony in children, pp. 69—76.

Children under 7 are liable to suffocating catarrh, it sometimes is fatal in a few hours. The fluids collect in the upper parts and soon bring on stifling, the patients dying from local excess of their own fluids; it much resembles the peripneumony following quinsy. The cure is (in) freeing the organs of respiration from this mucus as soon as possible. I use 1 oz. manna, a dr. sal catharticum, 60—70 drops essence of antimony or a grain of tart. emetic to be made into a mixture with 4 oz. water, one common spoonful every quarter hour till the child vomits and purges. The patient should sit in

warm water to the waist a few minutes at a time, taking care not to damp(en) the linen, then wiped dry, etc.

Of nervous asthma or suffocatio stridula in children, pp. 76—80.

This occurs mostly in a dry freezing state of air, but is never frequent; it attacks at any hour of the 24 but mostly towards evening. This disease seems to arise from a spasmodical constriction of the organs of respiration from the dryness of the parts. I have tried to cure it, as an affection of the nervous system, by anti-spasmodics without much success, such as warm baths, steaming of the lungs. The best remedies seem diaphoretics, opiates, etc.

Of quinsies, pp. 87—98.

When only the uvula and tonsils are inflamed I find no difficulty in removing it if I begin early by purging the patient and keeping his body moderately loose for a few days, applying a mercurial plaster across the throat, breathing the steam of hot water, gargarisms. Bleeding and clysters may be used in more acute forms, also blisters.

Angina, pp. 91.

An angina resembling that which is called putrid now and then appears among us but never epidemically. It appears in Feb., March and, sometimes, in April when the preceding winter has been mild and moist, but more frequently at the end of summer. The fever is high, the pulse hard and tense, the skin hot and dry, the uvula, palate and tonsils greatly inflamed; the tongue is swelled and often full of pimples, the tip and round the edges are red and seems bared of epithelium; in a few hours it will be covered with a thick brown coat. I follow the same antiphlogistic methods of evacuation etc.

Of the serous quinsy, pp. 99—101.

In the years 1744 and 1768 a quinsy of that sort called the mumps was epidemic amongst us, it had appeared at other times but not so generally. The symptoms, plainly show its

origin from glandular obstruction, owing probably to some degree of viscidity in the serous and lymphatic juice. Treated by blisters, purgings, mouth and throat gargled with mustard, with spirits of hartshorn etc.

Of the hooping-cough, pp. 161—170.

It is not epidemic in this climate; it generally appears in Jan. or Feb., few recovered before June and some not before November in 1759 when it was banished by the measles. In strong adults I treated by bleedings, purgings, etc., infants 1 drachm hartshorn, same tinct. canthar., 5—6 drops laudanum, about 20 drops essence of antimony, mixed, 5—6 drops to be given every second hour.

pp. 203—207. . . . Children between 3 and 7 are sometimes seized with fevers in which the head and nervous system are remarkably affected and convulsions come on. When the fever ceases the atony is so great that the patients are cold and seized with clammy sweats. These are signs of extreme laxity in the solids as well as colliquations in the fluids, the same are evident, at least locally during the fever. This fever does not intermit though it lessens somewhat; these opportunities must be used for giving the bark and oak bark made into a decoction with water, to which a little alum, spirit of vitriol, oil of cinnamon, cloves or mint may be added, and the patient should sip a little claret or red port wine mixed with some of these aromatics. Thus the succeeding fevers will be moderated, but these medicines should be given a week after the fever ceases. If one waits for intermission of the fever to give the bark he may lose his patient. To prevent convulsions the bowels must be freed of flatulency by stimulating tonic and aromatic clysters made styptic in order to enable them not only to expel the expanded air but also to check the exuberant excretions, by constringing the internal secreting vessels. The necessity for blisters is also very apparent; after the fever ceases general frictions should be made.

Medical observations and inquiries. i. London, 1757, pp. 109—110.

Qu. Is it not the *Opisthotonos* which proves so fatal to infants before they are nine days old, and which the women improperly call jaw-falling? Certain it is, that the symptoms are very similar, and I heartily wish some hint could be taken from what has been said for the relief of those tender subjects, in whom indeed *opium* cannot take place, nor does it promise any good, even in the smallest quantity, as it is generally owing to their having been preposterously fed before the guts have been cleared from *meconium*, that they are seized with this disease. I cured one by purging with an infusion of rhubarb, to which a few grains of musk, and a little *ol. tart. per deliq.* were added, together with the warm bath, and the frequent injection of glysters made with an infusion of camomile flowers, to each of which a small proportion of Castile soap was added."

The last notice I am aware of, concerning anything connected with pediatrics is a reference on vaccination contained in the *Columbian Sentinel* of March 12, 1799, by Benjamin Russell. It is found at p. 28 of "a dissertation on the progress of medical science in the Commonwealth of Massachusetts." By Josiah Bartlett. Boston. Printed by T. B. Wait & Co 1810, and is as follows: "A Boston Newspaper furnishes our earliest information on this subject" (of vaccination) "by Benjamin Waterhouse, who in 1800 (1802 and 1810) published historical and practical treatises on the Kine pock, in which his indefatigable exertions for its extension, to every portion of our country, are minutely detailed. In July, 1800, he procured matter from Bristol in England, with which his son was the first person inoculated in the United States."

THE PROBLEM OF APPENDICITIS FROM THE MEDICAL AND SURGICAL POINTS OF VIEW.

ANNIVERSARY ADDRESS, 1900.

BY ROBERT ABBE, M.D.

Mr. President and Gentlemen:

When I was asked to address this meeting upon a subject of common interest to us all, I felt that thought and experience justified the choice of a topic of such wide-spread interest as the one I have chosen, even though the literature of the past few years teems with contributions to the subject.

It needs no apology that I should speak of that which has appalled the modern surgical world by its gravity and ravages, and taken from us some of our best leaders and workers—Agnew, Little, Griswold, Lincoln, and a host of others —which has come to the doors of our homes, and strikes so quickly and so fatally when it does come. The subject has few rivals in the surgical field, and takes rank to-day with typhoid, pneumonia, and rheumatism, in medical thought. Surely, when the active surgeon of to-day can number one hundred operations for diseased appendices yearly—and there are a dozen such men in this city and in other cities in the same proportion—we begin to grasp the importance of the subject and its menace to the community.

Surgical propositions and novelties loom up from time to time before the profession with apparent significance, only to be lost to view and to memory in another year. They die young, because the estimate of their importance is erroneous, but this subject lingers in the eye of the profession.

The problems of surgery to-day are fewer than they were

twenty-five years ago, although there is vastly more surgical work done. This period has seen great changes in the class of cases that fall into the hands of the operator. Then, strangulated hernias were extremely common; to-day, owing to the vast number of radical cures, they are comparatively rare. Pyæmic joints and abscesses were then the daily care of the surgeon; to-day they constitute a small proportion of active work. Abscess of the kidney, so fatal then, is now relatively infrequent, owing to care in preventing cystitis with ascending infection, due to the use of impure catheters. Aneurisms and tertiary bone lesions are comparatively rare, owing to better understanding of primary and secondary diseases. Tuberculous lesions seem to me, also, to be much less common, owing to more careful isolation of the infected subjects, better house sanitation, and milk and food control. In fact, it would seem that the statement were almost true, that no profession is doing as much as ours to end its own existence. Yet, as soon as one problem is put upon the list as better understood another comes up for solution. We may rightly take the view that this subject of appendicitis is as capable of expression and demonstration as a problem in algebra. There is yet a widespread division in practice as to the wisest care of any case, but if the theory and knowledge of the subject were presented before two equally discerning minds, they would both arrive at the same logical conclusion. I speak, therefore, of this problem of appendicitis, not with the intention of reviewing its history, or wearying you with statistics, or to exploit any of my own; not to make an exhaustive consideration of the subject, to enumerate the numberless contributions to its literature, nor to reiterate the oft-repeated methods of operation; not even to dogmatize as to what should or should not be done. I would simply present those comprehensive and essential features seen by those of us who come in close contact with the internal appearance of

the appendix and surroundings, features which are unknown to the practitioner who rarely sees the diseased organ. Each physician must satisfy his own conscience as to his advice to the patient when he has once comprehended the subject. The question, as still in the public mind, is, "Have we entered on a cycle of epidemic appendicitis analogous to one of diphtheria or plague, or is the conspicuous appearance of the disease like the similar sudden discovery of pneumonia within the professional recollection of most of us?" If it is an epidemic, it will be found to present a group of symptoms unlike those of any disease of previous years, but if it is the result of better understanding of an older disease, classified under a newer name, just as pneumonia was sifted out of the greater group of "congestion of the lungs," which formerly included pleurisy, suffocating bronchitis, etc., then we shall find the symptoms in older text-books so described that we can identify the disease there.

The public continues to ask the physician what was appendicitis formerly, and he answers: Probably it passed under the description of "inflammation of the bowels," or "peritonitis." It is true that less than a generation ago numberless people, in the course of summer travel, were stricken with so-called inflammation of the bowel or peritonitis, and died.

Now, we hear of no one so reported, but it is said, "he had an attack of appendicitis, was beyond the reach of a surgeon and died," or "So-and-so had an attack of appendicitis, was operated upon and recovered." Hospital statistics show the same changes of tabulated diseases. It is merely a new name, not a new disease.

Before we can consider the subject intelligently, we must perfectly understand the morbid condition existing in the appendix, which is the cause of the outbreak. There is no aid to an understanding of the subject at all to compare to seeing the exact physical state of the organ as shown in a

large series of preparations. I cannot but feel that if we keep this in the mind's eye, it illustrates every new case which one is brought to face. While it is true there are no two morbid specimens entirely alike, the universality of the presence of internal stricture, of septic infiltration, and of obstruction leads to all the destructive sequelæ.

I wish first to present for careful study a sufficient number of specimens selected from several hundred and arranged in groups of ten which will amply illustrate these facts. Most of these preparations have been removed in the interval between attacks, or at the onset of an acute one, and therefore represent the morbid condition always lurking in the part. It has been customary, on removing an appendix, for the operator either to pass into it a probe, or to cut it with scissors, or to drop it into alcohol, for pathological study, where it shrinks to a hard meaningless remnant. But in no such way is it possible to grasp the conditions presented by the disease. The preparations here shown have all been treated by first distending them with alcohol and hardening them in it; then cutting them lengthwise, thereby demonstrating the tightness and number of strictures, the pocketing of the appendix, and the condition of the contained stone in view. (See *Medical Record*, July 10, 1897.) The resulting demonstration is of the utmost interest. One can see most graphically the cause of all symptoms. Observe in this first series, for example, "single strictures." You will see them near the colon in one—near the distant end in another. All are quite tight, permitting only a bristle to pass, and you will see a horse-hair passed through some of them to direct the eye to it. In one only of the single strictures, which have been removed for the attacks they have caused, is the size reduced to but a third of the normal calibre, and that gave serious trouble, because the distention of a six-months' pregnancy bent the appendix and closed the stricture, producing for the time mild septic symptoms.

Observe others with multiple strictures, each tight enough to permit alcohol to pass through and distend the next cavity in the appendix, so that five or six successive strictures and channels are seen. When removed from the body, these pockets contain muco-purulent fluid, sometimes pure yellow pus, full of infectious bacteria. The colon bacillus is always present, and by authorities is considered the most virulent. The symptoms dependent upon this pathological finding are more apt to be found in the recurrent variety, alternating between a severe colic with slight fever and an attack of so-called indigestion, with three or four days' detention at home. Indeed, it is this, more than other forms, that is found in patients reduced to chronic dyspepsia and invalidism.

Observe another series in which concretions have formed. Many have been found in the cases of interval operation, but more are removed in the acute, grave, septic cases, in which fortune has brought the patient to operation in the first two days before destructive processes culminate.

The ever-present bacterial activity reduces the morbid effete material within the appendix to a condition capable of expulsion into the colon, or of absorption. So bacterial action, ever going on around the rootlets and sacs of the great trees and plants, breaks up and prepares nutrition for absorption from nature's mould and refuse in the earth.

But, as you see in several specimens, a momentary blockade occurs, interior tension rapidly arises, the bacteria are aroused to more virulent action; the walls suffer anæmia, devitalization, and necrosis, and give way at the weakest point, opposite to the pressure point of the stone. Now begins an instant change which has not been hitherto spoken of, but which is demonstrated by scores of specimens, and to understand which, gives a clew to most of the spontaneous cures. Immediately the evacuation takes place, if it be sudden, either by rupture or by overcoming the resistance of

the stricture and emptying into the colon, there is a prompt swelling of the lining membrane, which fills the tube and obliterates the space previously filled by the pent-up fluid.

Being impregnated with bacteria, it is inflamed and usually sheds its epithelium, so that a synechia or sealing of the opposing walls promptly follows. If by good fortune the thrown-out material is kindly disposed of by nature, there is an end of the trouble forever. A partial sealing, however, sometimes occurs, and a remnant of the canal remains to produce further trouble.

A series is here shown of such over-growth of the lining membrane and subsequent occlusion, both in the acute septic swollen condition and in the later obliteration, and tells the story to you of many spontaneous cures better than words can describe. The student will not be deceived, however, by thinking that this ending is to any large extent the rule. As a matter of fact, it is the great exception. It tells us lucidly what we all wish to know, how a large number of grave attacks culminate in their own destruction. One or two of the series are of interest in illustrating the fact that even a completely obliterated cavity may leave an atrophied organ, which is the seat of disabling neuralgia, requiring its removal, which ends in restoration to health.

I have arranged one series of appendices, whose interior showed only small follicular septic ulcers. In looking at these, as at the others which have perhaps a more angry appearance, one must supply in imagination the putrefied contents which have been cleaned away in the preparations.

To all students of pathology, however, the ulcerations here shown, with points of entrance for poison, are ample evidence of the cause of slight septic fever accompanying the attack, for which they were removed. In some, the ulcer is a ring-like furrow, half-way or two-thirds around the tube, and, if they progressed to healing, would have in time resulted in linear strictures. It is capable of demon-

stration that an appendix once thus diseased does not again restore itself to normal health, because of its internal deformity. The detention of its contents, when once a stricture begins to form, converts it, as it has been aptly said, into a veritable culture tube.

The idea embodied in the word "catarrhal" appendicitis is, in the main, a correct one, and yet it so feebly expresses the morbid condition present in an attack of the disease that it should more properly be confined to the initial stage. Excluding the rarer cases in which foreign bodies are entrapped, or in which the kinking of the appendix from its short mesentery produces "obstruction"—the origin of the stricture is found in one of two causes; either the cicatrizing of the septic linear ulcer, or the contraction of the catarrhal inflammation antedating the stricture by many years. The age of the stricture is of the greatest importance in studying the subject. We know from similar contractions, resulting from inflammatory conditions in other parts, œsophagus or urethra, that many years often elapse before the closure is sufficient to give trouble; so in many cases of appendicitis in which study of the removed appendix shows one or more strictures, we follow back the history of attacks from five to twenty-five years, and thus can definitely say that such length of time was taken to develop the final grave conditions. We may say, therefore, that in the earlier years of life an infantile colitis, or a simple influenza, must have been the primary cause of an invasion which lurked in this, the only pocket of the alimentary canal, while the disease was swept from the main channel.

From this study we may say with absolute certainty that the first attack of appendicitis recognized by the patient is in most cases the end of the disease, for the appendix shows the presence of a stricture which must have existed for many years. If one disputes this point and says that strictures sometimes form very quickly, we still have a considerable

number of these specimens which we have studied that have behind the stricture a concretion which there is every reason to believe had taken years to form.

At this point let us understand exactly what these concretions are which you see in many of the specimens. Observe, first of all, that they are always on the side of the stricture farthest away from the colon. Their composition is of particular interest. They vary in hardness according to their age. It is rare to find any food products in their composition. They always contain a large proportion of desquamated epithelium mixed with pus corpuscles, the whole teeming with bacteria. If they are of harder variety, they are apt to be laminated and contain needle-like crystals and sometimes calcareous incrustations. These are indubitable proofs of the long existence of the stricture.

With some recent writers the erroneous idea still prevails that these concretions are formed in the colon and drop into the appendix, dilating it and producing trouble, but the fact that the concretion is always on the distant side of the stricture shows that it has grown where it is found.

Evidence is, therefore, complete that the stone does not begin to form until the stricture has contracted to so small a calibre that the exfoliated epithelium is unable to work its way into the colon in the ordinary process of elimination. Then the fluid contents of this terminal pocket alone pass through and the débris of epithelium left behind, irritating by its presence, begets proliferation, pus cells, and other evidences of decomposition. It is hard to conceive that this process could take less than a few years. I have recently had one case in which a gangrenous appendix containing a concretion had been preceded twenty-five years by a mild but typical attack.

In no case have I found concretions which were not detained by very tight strictures and composed of a desiccated cast-off epithelium of the appendix. These concretions will

always be found packed in close to the stricture, which is a most important consideration in understanding the mechanism of acute attacks. The hard oval body acts exactly like ball valve, or like a gall stone in the gall bladder, and when its presence has induced necrotic changes we will almost always find perforation at the point at which it presses.

To return to the possible primary cause of the catarrhal condition, I have twice removed an appendix a fortnight or more after the subsidence of appendicitis in conjunction with an acute attack of influenza, in both of which smart vomiting, fever, and exquisite tenderness of the appendix had ushered in the attack, and in which at operation acute inflammation with follicular ulcers of the mucous membrane of the appendix existed without stricture, thus illustrating that long after the system had thrown off the acute symptoms the appendix harbored this lurking infection. It is fair to presume that several years might have elapsed before the appendix would have had secondary strictures and a new variety of septic disturbance.

These illustrated Draper's suggestion, that in the recent wide-spreading epidemic of influenza there might be found an explanation of the origin of many a sequel in appendicitis.

It is seriously suggested that gout may be a causative factor in producing appendicitis, in view of the fact that minor attacks are relieved by salicylate of sodium and dietetic treatment, that it is occasionally seen in otherwise gouty subjects, and that mild joint inflammation is sometimes associated. Against this we have the argument that appendicitis occurs largely in youth and childhood; that operation always discloses a mechanical cause for an attack; that the peritonitis is uniformly of bacterial origin and not from gouty irritation; and that the type of joint disturbance is that of a low-grade pyæmic infection.

Above all things, we must consider the mechanical condition revealed in this study as absolutely the essential fact in

every recurring attack. The tightening stricture, the multiple pockets harboring the bacterial colonies, and the calculi therein formed, must be remembered by every practitioner as being invariably present in each case of recurring appendicitis. The study of the appendix removed in the interval, when to all appearance the patient has been cured, shows the almost inevitable future recurrence of these attacks. To understand these morbid states elucidates and explains all the symptoms connected with disease, and is the key-note of the entire situation. It stands proved beyond question that, between attacks, the strictured condition frequently shows no tenderness, and usually the appendix is impossible of palpation, even after years of recurrent trouble. I have preferred to speak of this condition as "latent" rather than chronic appendicitis, because the word "chronic" carries with it the idea of ever-present disease, which one would think could be felt, while as a matter of fact this particular organ has the property of hiding itself from discovery between attacks. It presents a "latent" danger, and the term expresses the hidden rather than the chronic aspect of the disease.

Given an appendix with one or more reasonably tight strictures, it is only necessary to produce transient congestion to swell the tissues and block the stricture. Hence it is easy to understand the frequent recurrence of slight attacks, which are seemingly dependent upon such incidents as a violent fall, wrestling, long bicycle rides, eating clams or green apples, or various other accidents, which, to the public, seem adequate cause. The acute attack, however, is really due to the general vascular disturbance of the alimentary canal, in which hyperæmia and excitement the appendix takes part. Even the menstrual disturbance provokes such acute attacks when the trouble is latent. The immediate sequel of the engorgement and blockade is an increased secretion within the shut-off tube with increased bacterial activity, the size of the appendix is at once inordinately in-

creased by the distention. This is demonstrated by operation done at the onset of the attack, when the surgeon often finds an appendix, which should be the size of a lead-pencil and three inches in length, distended to the size of the finger and five or six inches in length. When it is cut away it immediately shrinks to nearly its normal size, but when again distended with alcohol it reproduces the condition found at operation.

In this interesting elongation, the tip of the appendix will be found capable of a wide sweep among the bowels. It pushes across the median line, or to the bottom of Douglas's cul-de-sac, or sometimes upward to the liver. Under this high tension the penetration of bacteria, whose increased virulence is greatly enhanced by the pressure into and through the coats of the appendix, excites an immediate leucocyte exudation, so that thickening and œdema rapidly follow, and the bacteria penetrate the unbroken peritoneum. Without operation one can only conjecture what the early hours of an attack of appendicitis exactly represent, but if a physician could be present and witness the findings on first opening the abdomen during an acute attack, the appalling picture often presented would startle the most conservative mind. Even in most attacks which would subside under medical care the swollen, purple, slimy appendix, often bathed in turbid serum, presents an angry and menacing appearance. This unpromising condition will be quickly overcome when the pressure within the appendix is sufficient to overcome the stricture and discharge its pent-up fluids into the colon. At a later attack, the stricture being tighter, the infection and destruction having proceeded still further, we may see an appendix altered from a mahogany color of capillary stagnation to the poisonous green appearance of beginning gangrene. Nothing more perilous to human life can present itself to the eye of the operator, and yet, gross and threatening as it appears, we see a stage of the decay of the

tissues that precedes the formation of abscess in many of those cases which may be even conducted to a natural cure without operation.

Again we find in very early operations the distended appendix covered with thick gray membrane, no less virulent looking than diphtheritic patches in the throat. This seems to be the most severe challenge to nature for cure. The surgeon is prone to present such gross and offensive organs to the physician for whom he is operating, and challenge the belief that a few more hours would have produced a fatal issue. It becomes the privilege of those who study both the conditions at such a crisis in the disease, and of other conditions discovered at the time of operation in the interval between attacks, to show that nature is perfectly competent to cope with any of the gravest forms of disorganization in a limited number of cases—a very limited number, as attested by the long death-roll.

When we have learned from experience that there need be hardly any deaths when operations are properly done, no matter how acute the stage, we see a contrast that does infinite credit to modern surgery.

The glaring inaccuracy of comparative estimates of cures by medical and surgical measures is self-evident when we realize that every case coming to operative cure represents from five to twenty medical cures, for careful search of the histories shows every patient to have been under physicians. time and again, in previous years for a two days' or a week's illness, and each time "cured." I remember, some years since, the illustrious Dr. Loomis told me he sent almost all his appendicitis cases out of the hospital "cured"; that is, he said, "frequently with a small hard lump still remaining inside." So when Ewald says ninety per cent. are cured by medical means, it means only that a lull has occurred, and that "latent" trouble remains each time, though the patient does not feel it then. It is the rarest incident to have a

patient unable to recall past attacks, and we must add to those recalled a few more that most patients forget, in the beneficent oblivion to which nature consigns our memory of pains.

We must reconcile the ever-recurring difference between the medical and surgical view of the subject. The physician always wants to postpone, and the surgeon does not dare to take the responsibility of postponing. Why is this? The physician who says he has always "cured" with medicine has made his observations most carefully. That he is conscientious and consistent no one questions, and it becomes the duty of the surgeon to acknowledge to him that the evidence presented in the abdomen, in the region of the appendix, as found by the surgeon in the operation done in the interval between attacks, proves the correctness of the medical view: that, without the aid of the surgeon, nature is often capable of coping with the very gravest complications unaided, and of restoring the parts to almost a normal condition, so that it ill becomes the surgical observer to deny any case of possible restoration to health. It remains with him simply to show that the vast number of so-called "cure" cases are of a mild attack, while the disastrous ones may possibly undergo spontaneous cure, though it be rarely. Some of the exhibited appendices were removed after recovery to health from patients who had unquestionably experienced general septic peritonitis from a rupture of the distended organ, which had scattered its putrid contents widely through the abdomen, begetting a profuse septic effusion, with intestinal paralysis, tympanitic distention, and profound septicæmia. Operation after recovery showed universal intestinal adhesions; a cicatrized point of rupture on the appendix, and concretions and stricture within it, awaiting another opportunity for trouble.

Again, when the preparations are studied by the method demonstrated to-night, one frequently finds, long after grave

attacks, the cicatrized perforations sometimes at two points, indicating different attacks, and nothing but a few adhesions to show the remarkable power of nature in clearing up the infection. Around such a point one will occasionally find buried in the adhesions the remnant of an old abscess of large size, dried down to perhaps a teaspoonful of sterile yellow débris. Although this is often seen in other parts of the body, it is nowhere more impressive than when found so close to vital parts.

One noteworthy specimen shows the appendix open at two points into the intestines, where it had discharged numerous calculi, some of which yet remained in it.

It must have happened to every operator, as it has to the writer, either to have been refused the privilege of operation, or himself refusing to operate in cases nearly moribund, that the patients have recovered, more often perhaps by the spontaneous evacuation by ulceration into a neighboring intestine. Yet to the surgeon these cases are no offset to the hundreds of cases of fatal attacks which happen every year, all of which were failures of nature, because of the overpowering infection, and almost every one of which could have been saved by a very early operative procedure. The feeling is growing among experienced operators that no acute case can be at any time more safely operated upon than when first recognized.

Apropos of the query, Why and how do so many of our cases of appendicitis make a spontaneous recovery? we face the marvellous revelations of the intrinsic natural power of recuperation in every form of malady to which our bodies are subject—fevers and injuries as well. We study and we wonder; we speculate on how little human agency has to do with it beyond guiding nature. We aid the fallen giant to his feet, but how little do we do to make him walk. We face the destruction impending in the bacterial warfare against the human organism, and by intelligent guidance we

aid the unknown power which restores health. But what that agency is, we do not know. The recuperative power! What is it? Shall we in this advanced stage of science, still sum it up in the words vital force, that unfathomed thing called "life"? The intelligent act in recovery! Whose was it? Yours, or that something in the patient that made for health? This is an ancient query—not yet answered by the hosts of eager scientists, whose only explanation of the ordinary laws of repair is to ascribe to the cells of the body a natural tendency to restore themselves to normal states, a hereditary tendency to right themselves when wrong, and an adaptivity to defend themselves against assault. The human body, as a whole, is considered an intelligent entity composed of orderly but unintelligent cells.

That has always seemed to me an assumption, and, from analogy and observation, I am quite willing to accept the view that every cell is sentient and acts with a purpose by volition, for will cannot be placed in any cell or group of cells, and why may it not be universal? Does not every fibre of the body cry out with pain; does not each organ resent abuse? Lubbock shows the minute insects, like the ant, to be endowed with a high order of reason; they build, colonize, police, go to war, lay by stores for seasonable use, etc.

The individual cells of the swift-growing mushroom can be studied in their life history, confined for a few hours under the microscope, and each cell is said to display affinities and even affection in relation to others.

Why should we, as trained beings, self-classified as of a higher order, arrogate to ourselves the only capacity to deal intelligently with repair in surgical emergencies? Who among us could do anything, did not the extraordinary novel action of each cell lend its aid in new circumstances of its life?

Those which had for half a lifetime repeated their daily

growth, death, and reproduction, suddenly spring into activity in a new rôle without our volition. The healing of even a mere scratch is a study of orderly, exemplary, and intelligent reproduction of cells after a new plan, as if they had been drilled all their lives to wheel into line, and do exactly what was needed, but which was not their previous habit. A hernia suddenly becomes strangulated! At once an intestinal peristaltic action that had for forty years been downward is reversed, as shown by nausea and other symptoms, as if an engineer reversed his engine to avert danger, and why? For no other reason than to help try to pull the loop of intestine out of the pocket in which it was caught.

We think of elaborate warfare of drilled troops, marshalled by thinking generals, as evidence of God-like intelligence. But what of the revelation of science that most diseases are an invasion by bacterial armies which would conquer, were it not for successful resistance of hosts of infinitely small but friendly cells, acting without our control, attacking the invaders, as the picture has been truthfully drawn, and in vast numbers going to their death, as seen in so-called pus, dead leucocytes merely—soldiers on the field after the battle.

But we stand aghast at the methodical procedure of those who met the invading bacteria, embraced and devoured them literally, and thus compassed the recovery of the patient, for which we and the patient take credit. Observe the invasion of tubercle bacillus in a healthy body. Follow the instant array of resisting cells, the leucocyte attack on the foreign invader, the quick hyperplasia of cells, to barricade and surround the group, the starvation of the prisoner, his death, and ultimate disappearance.

Whose is the glory when incipient consumption is conquered? We arrogate too much when man's intelligent action is placed above that of the individual cell.

In laboratory research and philosophical discussion of the

still incomprehensible process of repair, as shown in inflammation, it is easy to say "we must dismiss from our minds all ideas which introduce the conception of something in the nature of an intelligent foresight on the part of the participating cells," but only materialistic prejudice will thus beg the question in favor of the not yet proved adaptability of cells to follow only their hereditary and physiological habit of reparative growth. We may say there are certain innate bactericidal and phagocytic properties of cells "called into action" by the presence of inimical poisonous bacteria. Why not, with equal or greater probability, say, "they enter into action?" It is as just to say that a trout jumps at a worm without volition, or that a beaver builds his dam without thought. In realms of beings of higher development than man, he may be regarded as endowed with less will than he now regards the wonder-working amœba.

The imperfect outcome of Nature's repair at times when she signally fails to overcome disease is no more argument for the physiological rather than sentient action of her component cells, than the trout's leap for a false fly, or the beaver's dam being inadequate for a heavy flood, is proof of lack of intelligence.

The more elaborate proceedings of repair, in the terrible emergencies of appendix disturbance in the very centre and vital parts of the body, are seemingly after a design that often the human mind could not rival in ingenuity and sometimes studied success. For instance, the appendix becomes blocked by a stricture at its attached end, and being distended and loaded with deadly contents to the muzzle, smears itself over with a gluey coat and seeks to attach itself to some convenient outlet for its foul contents.

To evacuate into the peritoneal cavity is death to its owner, but if, by care, it can seal itself to another piece of bowel or the bladder, perhaps it can save its owner's life, and discharge into the outer world. It makes the effort!

Very often it succeeds, and we see such amusing accidents as an appendix discharging for years into the bladder, a miscarriage of justice, as it were, but designed—designed to save the patient. Who designed it? Not the owner of the organ. And what established habit of it, or its ancestors, taught it, or left it a heredity that came so opportunely in use? We stand appalled at the efficiency of Nature's methods at times, and yet she is a most bungling surgeon! Wonderful at repair, but a bungling surgeon.

And this idea brings us to consider the fatuous hope that lingers in the mind of all physicians, that what has happened once in repair will occur always; that reliance can be put upon the oft-witnessed success in ending this disease without operation. We may admire her reparative power, but must call her to account for her innumerable failures, and supplement her by the precise and successful methods of modern surgery.

Interest in the subject under discussion is doubly increased when doubtful cases bring the physician and surgeon in consultation; when at times a single symptom will turn the scales of doubt, one could often wish for unerring indications of the diseased appendix. One soon learns that pain over the appendix is not always present, or when present it may simulate other pains, so that an attack of gravel can be so like an appendical colic that only the discovery of a few blood cells in the sedimented secretion of the kidney will tell the presence of irritation of a small stone. Even the most characteristic local descending pain along the cord and bladder irritation may be simulated by adhesion of the appendix to the bladder surface.

The most complete experience of variations in symptoms is often required to differentiate between the disease in question and even so unlike a disease as typhoid fever, which in its onset is well imitated by it.

What has already been so much dwelt upon in the pictorial

representation of its pathology, helps us here to understand why the mild pyæmic condition may simulate typhoid, and it becomes a deeper problem than usual to summon other resources, such as the leucocyte count of the blood, to determine the diagnosis.

This latter study of leucocytosis has grown to much importance in differential diagnosis. Typhoid fever can often be eliminated, because, if uncomplicated by ulceration, which is wanting in its early stage, there will be little or no increase in leucocyte development.

On the other hand, progressive leucocytosis in which 12,000, 15,000, 20,000 or more are found, indicates a progress in ordinary appendicitis to a certainty of abscess formation.

Again the sudden development of very marked leucocytosis, with diffused peritonitis, is an argument for the successful outcome of operative work, no matter how grave the appearance of general infection.

Many valuable observations are accumulating, so that we can get much help in diagnosis and prognosis from this newer aid.

It is not my purpose in this paper to enter into further scientific study of the many ramifications into which one might be led, though one may well have attention directed to the variety of hitherto unsuspected maladies of which this little organ is now recognized to be the frequent cause.

Its manner of hiding itself from suspicion is nowhere better shown than in conditions of profound pyæmia, into which a patient may be plunged after a day of appendix disturbance, followed by an absolutely painless condition when the physician is called on the second or third day. Then, perhaps, the patient has a chill, and profound pyæmia with graver and graver symptoms follows. The physician is justifiably in doubt of a cause, on account, incredible as it may seem, of the absence of local signs, although a septic

phlebitis of the larger veins adjacent to the appendix is present. Several times I have witnessed this local peritoneal anæsthesia masking the real cause of fatal pyæmia.

The resemblance of appendix disease to a large number of internal troubles would afford a chapter in surgery of great importance to the student.

The mimicry of other diseases by appendix disturbances is so accurate, at times, that the physician has to suspect this complication, not only in any case of supposed gallstone pain, or that of movable kidney, or that associated with progressive dysmenorrhœa, but he must regard the ordinary colic, or the recurrent pains of indigestion to which the "chronic dyspeptic" is subject, as surely due, in many cases, to this cause.

It has been my hope to show that this problem is capable of such demonstration that the ever-recurring difference between the medical and surgical view of treatment should be reconciled.

Easy as it is to fall into the "waiting habit," the medical inaptitude for operation is not consistent with the seriousness of the subject.

Our greatest practical life insurance companies recognize that a single attack of appendicitis disqualifies from insurance for one or two years; recurrent attacks disqualify until the removal of the appendix.

I have shown: that inflammatory strictures are almost universally present, the foundation and cause of the subsequent disease; that while they are uniformly of slow growth the real mischief does not begin until occlusion occurs; that attacks are often cured by natural method; that a long respite does not mean a cure; that it is impossible to predicate a cure; that, unless the appendix is out, the disease is always "latent," when once it has begun.

In all studies of medical problems, truth spells itself out

letter by letter, and it is many years before united opinion allows the knowledge of a topic to be incorporated in the surgical creed.

There will probably always be some diseases which will be beyond the successful management of the doctor. This subject, however, has now been lifted from the opprobrium of the past. It is one to which the cynicism of Matthew Arnold cannot now apply, when he says:

> Bring not to see me cease to live
> Some doctor, full of phrase and fame,
> To shake his sapient head, and give
> The ill he cannot cure, a name!

SOME SURGICAL TENDENCIES FROM A MEDICAL POINT OF VIEW.

ANNIVERSARY DISCOURSE, 1901.

BY REGINALD H. FITZ, M.D.,

OF BOSTON.

It was not without considerable hesitation that the honor of addressing you this evening was accepted, especially as what I am about to say is somewhat opposed to the prevailing tendencies of the day and relates rather to differences of opinion than to well-established principles. If I pay too much attention to the other side of the subjects brought before you it is because this is less urgently advocated at present than the reverse. The importance of the subjects, however, is unquestionable since they belong to the border-land of medicine and surgery and may be stated as some surgical tendencies from a medical point of view.

The region mentioned obviously includes both the province of the physician and the domain of the surgeon. These terms may be supposed to represent the modest claims of the former and the imperialistic tendencies of the latter. It is common ground, however, and the successful advance of either surgeon or physician into the region previously occupied by his colleague will always be welcomed provided the interests of mankind thereby are served.

The improvement in methods of surgical procedure during the last thirty years has so greatly increased the number and variety of surgical operations that it has seemed to me desirable to question the value of some of these and especially to pay more attention to the subsequent history of the

patient than to the immediate success of the operation. As physicians we have been duly impressed with the progressive diminution in the mortality-rate of operations, but we are far more concerned with the degree of benefit which the patient may have experienced. For centuries the pathologist has taught that there are diseases so mortal in their progress as to be regarded as practically incurable. The advance of knowledge shows that the number of these apparently incurable diseases is somewhat diminished by a more intelligent classification of symptoms and lesions, and that all diseases which have received a common designation are not necessarily identical. There still remains, however, a considerable group of what the physician regards as hopeless cases, and of late years especially he has been in the habit of asking his surgical colleagues to make some attempt to relieve the condition of these patients. Numerous efforts have been made and most encouraging results have been published, especially elsewhere. Unfortunately, when the comparison is drawn between such results and those under familiar conditions the conclusion is not so satisfactory as is to be desired.

It will readily be admitted that a sufficient trial of surgical treatment is justified in many cases where mechanical disturbances exist which medicinal treatment cannot relieve, provided the life of the patient is not endangered by the operation. Experience has shown that certain cases previously regarded as extremely dangerous or fatal without surgical treatment have been greatly benefited if not cured by such treatment. On the other hand, experience also has shown that immediate death, extremely short relief, or prolonged suffering have resulted from operations designed to give longer life or greater freedom from distress than the physician could hope to offer. The surgeon is willing to operate upon the presumably hopeless case because the patient often survives the operation and may be benefited. The benefit is to be hoped for since at times the diagnosis proves

faulty and remediable conditions are found. If the diagnosis proves correct and incurable lesions are met, the patient is regarded as no worse off than before the operation, while the latter may relieve suffering and prolong life. The physician, therefore, is encouraged to transfer his patient and give him what is often called the benefit of the doubt. Unfortunately, a not infrequent result of the operation under such circumstances is the death of the patient somewhat earlier and with more suffering to mind and body than if spared the surgeon's aid. In such cases the value of the doubt must be considered as problematical.

The failure of the surgeon to relieve to any great extent the sufferer from a supposedly incurable disease leads him to request the transfer of the patient at a time when the characteristic features of the affection are less pronounced, with the hope that the morbid process may be arrested at an early stage. Indeed, he may wish to attempt relief at a time when in the light of our present knowledge it is impossible to make a diagnosis. The physician may suspect the grave, perhaps fatal nature of the malady, but, owing to the similarity, if not identity, of the symptoms to those of less serious conditions, he feels compelled to wait for further developments.

The surgeon, on the contrary, would at once make an exploratory incision on the ground that the better the patient's general condition the less the immediate danger from the operation to the patient's life, and if the supposed lesions are encountered the chance of relief is increased. But the diseased appendix is found normal, the acute intestinal obstruction proves to be a phantom tumor, the incarcerated gallstone is non-existent, the abdominal tumor becomes a harmless enlargement of the liver. Exploratory laparotomies are undertaken for the relief of suspected cancer of the stomach and no cancer is disclosed. There are patients, too, often more desirous of the operation than is the surgeon who is to perform it. The experience presumably is not unique

in which a patient undergoes removal of the ovaries, uterus, and vermiform appendix for asserted pelvic and abdominal pains, and subsequently presents herself for surgical exploration of the region of the pancreas. The pain referred to this organ proves, without operation, to be dependent upon disordered gastric function of neurotic origin. Dr. Foote at a recent meeting of the Harvard Medical Society of New York reported the case of a young man who complained of abdominal pains. The physical examination showed the scars of four laparotomies, one of which had been performed in Russia and three in this country. On the same occasion Dr. Gibson mentioned that a normal appendix, seven inches long, had been removed from a patient who claimed to have had previously seven attacks of recurrent appendicitis. The patient, not content with this demonstration of a normal appendix, subsequently applied at the Roosevelt and Bellevue Hospitals for treatment for appendicitis. It is not to be wondered at that the host of neurotic and neuropathic men and women seek for operative relief for real and fancied ailments when they receive such advice as the following, taken from the editorial column of a daily paper: "It is probably true that the Dowager Empress Frederick's life could have been saved if she had been willing to have her stomach amputated. There are enough stomachless human beings alive and flourishing, and slight enough record of failures of the operation to have made the chances distinctly even. The discomforts are not many, either; a few rules must be followed. The food must be cut up very fine and carefully masticated. One must show moderation at meals. The man without a stomach cannot eat as much as the man who has one. Everything must be warm, because the stomach, which heats food for the intestines, is missing."

Exploratory laparotomies whether by advice of the physician, desire of the surgeon, or urgency of the patient are only too frequent. They are not without considerable danger

and often disclose conditions which cannot be relieved and which might have been appreciated without an operation. The high mortality in such instances often is attributed by the surgeon to the disease and not to the operation. Not infrequently they are undertaken without sufficient forethought. They tend to make the physician superficial in observation, since the diagnosis is to be made definitely by means of the operation. They lead the surgeon to become only too ready to act upon the diagnoses of those often incompetent to make them, either through ignorance or inexperience, since the actual condition is likely to be made clear by his skill. Each case should carefully be scrutinized both by physician and surgeon before this operation is undertaken. The former may find conditions which will nullify the success of any operation; the latter may be led to recognize that the exploration can but add to the discomfort of the patient without prospect of any definite relief. It should not be made for diagnosis simply, but always for the purpose of curing disease or of relieving suffering. The art of the surgeon should ever be regarded as sanatory and should be called upon as rarely as possible to make a diagnostic procedure of what is essentially a therapeutic measure. The exploratory operation which discloses nothing is more likely to reflect upon the judgment of the surgeon who performs it than to represent a tribute to his skill.

In partial justification of these statements, as well as of others which are to follow, I have asked a former assistant, Dr. G. A. Waterman, to examine the records of the Massachusetts General Hospital during the period of ten years from 1890 to 1900. This decade was selected, as it is recent enough to include many of the advances which have been made in operative technics and the years represented are sufficiently numerous to furnish an experience of profit. The value of the evidence lies in part from its source and in part from its representing the experience in a single in-

stitution of a number of surgeons identified with the practice of surgery in general.

The following table shows the increasing frequency and various results of exploratory laparotomies at this hospital. It is not asserted that all such operations occurring during the years included are tabulated, only as many as could readily be ascertained by an examination of the records, hence the figures are to be regarded as chiefly of relative value. Many successful explorations undoubtedly are recorded under titles other than that of exploratory laparotomy. The total mortality and the failures to cure may be distinctly less than stated, but they indicate sufficiently that an exploratory laparotomy, except in especially selected cases, is an operation which carries a very decided immediate risk to the life of the patient and a very considerable doubt as to the degree of relief to the symptoms. In general, with the increasing frequency of these operations there is some lessening of their mortality-rate, although the percentage of relief and cures is not especially improved.

FREQUENCY AND RESULT OF EXPLORATORY LAPAROTOMIES AT THE MASSACHUSETTS GENERAL HOSPITAL FROM 1890 TO 1900.

	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899
Number of operations.....	10	5	15	13	15	21	39	23	42	30
Cases of malignant disease .	8	2	9	8	5	8	25	7	28	18
Number of deaths	3	2	7	8	7	9	11	13	16	11
Failure to relieve	6	2	5	3	2	5	22	3	17	13
Relief or securing diagnosis.	1	1	....	1	2	5	5	4	6	5
Cure.....	....	....	3	1	4	2	1	3	3	1
Percentage of malignant disease	80	40	60	61	33	38	64	30	66	60
Percentage of deaths.....	30	40	46	61	46	42	28	56	38	36
Percentage of failure to relieve or cure.....	90	80	80	84	60	66	84	69	78	80

The relief of suffering and the lengthening of life are legitimate aims for the surgeon as well as for the physician.

The methods of the former are necessarily so much harsher than those of the latter that it may well be questioned whether too many operations are not performed with these objects in view. Granting that life may the more be prolonged by the aid of the surgeon, is the life thus extended worth the living? Neither physician nor surgeon can answer this question with any degree of certainty until the life of the patient has been lived. But the physician and surgeon are called upon to advise and are not always united in their opinions. It is often the tendency of the surgeon so to express himself to the sufferer that the latter frequently is made more hopeful than is justified by the evidence at hand. He is likely to bring before him the most favorable outcome of the suggested operation. The mortality is apt to be placed as low as has been obtained by the most skilful and experienced of the world's surgeons, although it may be far the reverse in the practice of the surgeon concerned. The degree of relief obtainable is likely to be exemplified by the exceptional instances, not by the rule, for the surgeon is more likely to recall the few successful cases seen at more or less frequent intervals than the numerous fatal cases of whose history after recovery from the operation he may know nothing. Assuming that the diagnosis of the conditions suggesting surgical treatment is clear, it is often found that complications exist rendering any treatment useless. The resection of ribs and drainage of the pleural cavity in pyopneumothorax seem of but little value when there is extensive tuberculous infiltration of the lung on the side opposite the diseased pleura. The operation must be regarded as worse than useless if at the same time there is evidence of amyloid disease of the abdominal viscera. What avails the extirpation of a renal tumor if at the time of the operation secondary nodules are present in the brain or lungs? The more learned in pathological anatomy the adviser is the more cautious will his prognosis be. Unfortunately, it is

the tendency of the day for the surgeon in general to neglect this branch of knowledge. He is inclined to devote himself rather to the bacteriopathology which makes his operation succeed than to the post-mortem examination which usually gives ample evidence of the cause of the patient's death.

It may be unwise for the sick man to be placed in any other than a hopeful position before the operation, but the latter should not be decided upon until those nearest the patient are as thoroughly informed upon all points as possible. It is especially for the physician on such occasions to realize his responsibilities and to prepare himself to meet them, since it is he who eventually is the less likely to be relieved of them. He cannot discharge this obligation by transferring his trust to the care of the surgeon, but should endeavor to aid the latter to the utmost possible extent. The patient then will be in a better position to decide whether he will prefer the known to the unknown, for, with the best intentions of the surgeon, the future of his patient is only to be forecast by past experience, and, fateful as this may be, it not infrequently is rather to be welcomed than the alternative offered.

Such statements receive their strongest illustration in malignant disease of the alimentary canal. Both surgeon and physician are agreed upon the usually fatal outcome of this affection and the uncertainty as to its duration. They are fully aware that in many cases death is likely to be preceded by great suffering from mechanical obstruction. Nevertheless, the surgeon is ready to operate because there is a possibility of error in the diagnosis and the symptoms may prove to be due to a remediable cause, or the obstacle may be removed or overcome for the time being. The abdomen, therefore, is explored, first to make clear the diagnosis. Should this prove correct, even if there is evidence of extensive incurable disease, the inclination then is strong to

attempt some sort of relief by resection, gastrostomy, anastomosis or colostomy. The surgeon may urge resection on the ground that it has successfully been performed by himself or by others, and if the patient survives the operation pain is likely to be relieved and a life of usefulness may be prolonged for a number of years. He may present as an alternative anastomosis with its somewhat lower mortality and less favorable outlook as to the duration of life. With the discovery of conditions unfavorable to the former operation and mindful of the high mortality-rate of anastomosis, recourse may be had to colostomy with its customary disagreeable and annoying after-effects, producing at the best only a kind of relief for an uncertain period of time. The physician knows that without any operation apparently insuperable obstructions have yielded and indefinite periods of active life have subsequently been enjoyed. He knows that if the symptoms of obstruction persist the patient's suffering may be lessened by medicinal treatment, and that such treatment often is necessary even after temporary comfort only is obtained from an operation. He may know also that the surgeon himself, when asked what he would desire if in the place of the patient, has replied that he should prefer to die during the operation or to live the least possible time after it, than to prolong life at the probable cost of health and happiness. The higher its mortality the warmer would be his welcome of the operation.

In order to obtain the experience of patients after such operations upon the alimentary canal, an inquiry has been addressed to the friends of a considerable number of those who have been operated upon at the Massachusetts General Hospital during the period between 1890 and 1900 for diagnosticated and demonstrated cancer of the stomach and intestines. Information was sought as to the degree and duration of any relief which may have resulted from the operation. The replies which have been received, including

the information derived from the hospital records, pertain to nearly three-fourths of the cases thus investigated and show clearly what has been the melancholy outcome in many of the cases of this class of gastro-intestinal disease so generally cared for at the present time by surgeons. The pathos of some of these replies makes them all the more convincing.

It should be stated that it is probable that all the patients operated upon during this period are not included, that successes may have been overlooked, and that few or many of those from whom no replies were received are likely to have undergone the more favorable experience, if such it may be called, of prolongation of life, perhaps even of relief from suffering. Regarding the mortality and duration of life as relative, and the percentage of suffering as inexact, the evidence presented nevertheless must be considered as offering grave doubts as to any considerable benefit from this class of operations as a whole. It may be that the coming ten years will prove more encouraging, but the enthusiasm of the operator should not permit a warping of the judgment based upon so recent an experience.

In the series collected there were fourteen operations for cancer of the stomach. These included four gastrostomies, all the patients, with the exception of one not heard from, dying within two months, and four pylorectomies, one of which was not heard from, two died within the first month after the operation, and the fourth was relieved for several months; at the end of six or eight months, however, the last patient began to fail and died at the end of a year and a half.

Of the six gastro-enterostomies, four died within seventeen days, one "received no relief whatsoever and after twelve weeks of terrible suffering passed away." The sixth felt quite well for about two months after the operation. He was then confined to the bed the greater part of the time and "suffered untold agony" till his death nine months later.

There were ten cases of intestinal resection, of which eight died within a month after the operation. The ninth patient was found to have a girdling ulcer without gross evidence of malignant disease, although from microscopical examination regarded as an adenocarcinoma. He was at work as janitor and enjoyed fair health two and a half years after he was operated upon. The tenth patient was not heard from. Of the five cases of intestinal anastomosis two died within the fortnight following the operation, one lived six months and two have not been heard from.

There were forty-nine inguinal colostomies and the subsequent history of thirty-seven of these has been ascertained. Twenty-eight of the latter died within the half year following the operation. Two lived between six and twelve months; five lived twenty-seven and thirty months respectively after the operation had taken place. Thus only a few more than one-fifth of the cases heard from were alive one year after the operation.

When the question of relief of suffering is considered it appears that among sixteen patients who fully recovered from the immediate effects of the operation and lived four months or more after it, there was some or much relief in eight and no relief also in eight. The operation was regarded as "decidedly unsuccessful" in a patient who died a month later and in ten days after leaving the hospital. A patient who lived for two months was afforded "only temporary relief." Another living three months received "very little relief." One who lived four months was relieved "of the intense agony she was almost constantly suffering previously. After the operation the pain occurred occasionally." Her last four months of life, however, were spent in the hospital. Of a patient who lived five months it is stated "the operation was no relief. The pain from the running sore continued. Only for the pellets you prescribed in the hospital he would be screaming all the time. They had the

effect of deadening it." Another who lived five months "derived no benefit from the operation. . . . She suffered intensely except when under the influence of opiates. . . . No doubt the operation prolonged the suffering." A patient who lived six months after the operation had "slight temporary relief from acute suffering, but she never regained strength." Another patient also lived six months "free from pain that was severe until the end, and the chills were less. An ugly growth formed on the outside which caused him much uneasiness." The patient who lived sixteen months died "after a painful illness which lasted till death. Excepting a few days at a time he was continually in pain and under doctor's care." For one who lived twenty-one months "the relief did not last only about three months. Then he was a great sufferer the rest of the time." The life of one patient was prolonged "for two years, during which time he suffered continually. The relief afforded lasted about three weeks, and from that time on his suffering steadily increased." Of another patient who lived also two years it was learned that "he never was so he could sit up, but he thought it must have been a great relief to him to have the discharge come the way it did. He thought that he lived longer by having the operation, although he would have been glad to go long before he did, he suffered so much. He suffered a great deal, but he had a medicine . . . that took away the pain in a measure. . . . He said if it was to do again he should have the operation as before." The two patients who lived twenty-seven and thirty months respectively were relieved for a year. Each was then operated upon for a second time, after which the condition was one of invalidism.

There were eight cases of anal excision of rectal cancer, three of whom were not heard from. Of the others, one died within a week, two lived fourteen and eighteen months respectively, the fourth was living and well at the end of two

years, but in this case the nature of the growth does not form a part of the record of the case. The fifth patient is now alive and well, nearly twelve years after the operation. The microscopical examination of the specimen showed "a fibrous tissue stroma, the spaces of which were filled with epithelial cells." Nevertheless, the result in this case is so exceptional that a legitimate doubt must be raised as to the cancerous nature of the tumor. The evidence recorded is not sufficient to remove this doubt except from the mind of the sanguine surgeon. The patient who lived fourteen months became "an intense sufferer. He had to take morphine for relief. When he died he was a mere skeleton. When he got home he had not control of himself and used one pound of cotton a week; at the time of his death he used seven pounds." Concerning the patient who lived eighteen months it was stated that she "was relieved for only two months and then it began to trouble her and she lived until March 19, 1892, and some of the time suffered intensely. The last six months was under the influence of opiates most of the time."

Of the seventeen Kraske operations seven were not heard from. Of the ten remaining, seven died within the year following the operation. Three lived twenty-two, twenty-nine, and thirty-two months respectively. One patient remained in the hospital for two months after the operation, then returned to her home, "lived four weeks and was a great sufferer during that time." A patient who lived eight months after the operation "was a constant sufferer from the time he was operated on until the time of his death." Another one who lived twenty-two months "never worked at all, as he was not able. He did not suffer very much until he was home about a year, and after that he suffered something terrible, could not get any relief at all; he was just as helpless as any infant." Of the patient who lived twenty-nine months it was stated "that *no* relief followed opera-

tion. It was no doubt a success, but the cancer grew within a year, and although the operation prolonged my father's life, complications arose resulting from the *new* rectum, and it was worse, much worse than cancer. My mother died six months after my father. She passed through a serious operation, died also of carcinoma. If ever I have the dreadful disease I shall insist to be filled with morphine and die sooner, although I believe in operations, but not for that disease." The patient who lived thirty-two months "enjoyed fairly good health for six months, but after that she never saw a well day."

Of the cases of cancer of the alimentary canal, whose history subsequent to the operation for the relief of this affection was learned, it appears that 28, or 36 per cent., died within one week; 15, or 19 per cent., died between one and four weeks; 14, or 18 per cent., died between one and six months; 4, or 5 per cent., died between six and twelve months; 9, or 11 per cent., died between one and two years; 4, or 5 per cent., died between two and three years; 3, or 3 per cent., lived as above stated. Thus 54 per cent. of these cases died within a month after the operation and 72 per cent. within six months. Any considerable prolongation of life applied, therefore, to less than 30 per cent. and to many of these the life was one of suffering and sorrow, necessitating the frequent or constant use of opiates to obtain any measure of relief.

Intracranial tumors form another series of growths which have been operated upon for a sufficient number of years to permit a medical opinion to be formed of the value of this operation. Of the fifteen cases included in the decade under consideration the subsequent history is known in ten. Of these four died on the day of the operation. One died at the end of three days, a fourth at the end of eleven days, another at the end of three weeks, and one at the end of a month. Thus, within the month following the operation

eight out of ten cases died. The ninth patient died in the hospital at the end of ten weeks. Of the tenth patient it is stated "that previous to the operation he suffered most intensely from headache and vomiting with attending weakness. After the operation (the immediate effects having passed away) he was comparatively free from pain and there was some gain in his speech and paralysis. The second operation was more successful and he was much better, being able to drive and go about in the cars, etc. The improvement lasted until two or three weeks before his death, when he began to show signs of failing." He died seven months after the second operation, which followed the first by a month.

The treatment of tumors of the kidneys also occupies the debatable ground between medicine and surgery, and the experience at the hospital during the decade mentioned again offers but slight encouragement to the surgical treatment of this affection. There were eleven nephrectomies for malignant disease of the kidney, and replies were obtained relative to the fate of eight of these patients. Four died within a fortnight of the operation, another at the end of two months, a sixth at the end of three months, and another at the end of five months. The eighth patient was living and practically well three years after his operation. The examination of the tumor after removal showed that the growth, stated to be a sarcoma, proceeded from the suprarenal capsule, the kidney being but little altered.

Physicians will readily admit that the surgical treatment of external malignant tumors frequently offers a source of relief to pain, deformity, and incapacity with but little immediate risk to the life of the patient. With the recognition that the disease probably will recur, the hope is maintained that recurrence may long be delayed, that it may take place within internal organs and prove relatively painless, or that death may result from some intercurrent affection wholly

independent of the original disease. External tumors thus seem to fall wholly within the region of surgery. The physician, however, should stand ready to reclaim from the knife what may otherwise be satisfactorily treated. The surgeon is quite willing to transfer for medical treatment after operation the case of disease which may recur, with the hope of avoiding or postponing recurrence, but in certain instances it is apparent that medicinal or non-operative measures are to be tried before an operation is undertaken. No more satisfactory instances of the value of such treatment have been reported than those of W. B. Coley from the use of mixed toxins and those of F. H. Williams and others from the use of the Röntgen rays. Certain tumors of the neck in particular may be said to lie in this borderland of medicine and surgery. Long regarded as demanding surgical treatment in the first instance, the repeated unsatisfactory result of such treatment inevitably leads to the conclusion that surgical methods are to be employed only as a last resort after other measures have failed. The patient seeks medical advice for enlargement of the thyroid gland. The physician, perhaps not well informed, sends the patient to the surgeon, who frequently takes the shortest way of ridding the patient of the deformity, unmindful that thyroids are not to be removed simply because they are enlarged. Indeed, the deleterious effects of this treatment are only too well known by those who have seen the patient subsequently suffer from cachexia strumipriva, to obviate the effects of which various modifications in operative treatment have been introduced and medicinal treatment has become necessary. It is always to be remembered, however, that we are mainly indebted to a surgeon, Kocher, for our knowledge of the curative effects of iodine in ninety per cent. of the cases, to say nothing of his more recent recommendation of phosphorus, thus rendering operative surgery unnecessary if not injurious in this proportion of the patients.

The wise surgeon realizes that the operative treatment of goitre is demanded only for such varieties as have undergone secondary changes. The colloid and cystic, the fibrous and calcified portions alone are those primarily demanding the use of the knife, provided the deformity is sufficient, while the parenchymatous enlargements usually rapidly subside when submitted to the treatment with iodine. If a part of the thyroid gland presents the characteristics of these secondary degenerations, it does not follow that the entire gland is disorganized. It is for the surgeon so to familiarize himself with the pathology of this structure as to treat what demands surgical measures, but to refrain from his treatment of such goitres, entire or in part, as can more successfully otherwise be cared for.

Even if the limitations of the medical and surgical treatment of goitre are well understood, it would seem that the relation of enlargement of the thyroid to Graves's disease is frequently misunderstood. The surgical treatment of the latter affection finds new advocates from time to time, and the value of this treatment is supported by columns of most encouraging figures. It must be remembered, however, that the term goitre means merely enlargement of the thyroid gland, and that such enlargement differs in etiology, structure and in associated disturbances of function. Admitting that the removal of a considerable part of the diseased thyroid from a case of sporadic goitre produces a cure by relief of the deformity and of the immediate mechanical and remote constitutional disturbances, it by no means follows that this operation is to afford a like relief in Graves's disease. In the former affection the goitre is a cause of the disturbances, in the latter it is one of the disturbances the cause of which is unknown. Removal of this deformity, so often a vascular goitre, merely takes away one feature of the disease and has repeatedly led to the sudden and unexpected death of the patient, either on the operat-

ing-table or while apparently in a state of normal convalescence from the operation. It would seem as if the reported successes of the surgical treatment of Graves's disease were attributable rather to a lack of agreement as to what should thus be designated than to the especial skill or good fortune of the operator. Buschan's conclusions from his analysis of such reports are so suggestive that in genuine Graves's disease extreme or threatening deformity alone is to be regarded as a satisfactory indication for the removal or obliteration of considerable portions of the diseased thyroid.

In like manner the surgical treatment of malignant lymphoma is to be disputed. Here again we have to deal with progressive disease tending to produce extreme deformity of the neck often before other parts of the body are invaded. It is only after many years, even centuries of observation and experience, that the glandular deformities of the neck have become more and more sharply defined, grouped, and classified. Even now there is apparent uncertainty and lack of agreement as to the significance of the term malignant lymphoma and the relation of this alternation of the lymph-glands to other changes in the structure of these glands. That certain of the regional enlargements of lymph-glands, with or without any considerable increase in the leucocytes of the blood, pursue the course of a malignant disease and eventually prove fatal is universally known. The resulting deformity is so annoying that the patient hopes to find speedy relief in the extirpation of the tumors. The uselessness of this treatment of leucemic lymphomata seems almost universally recognized. In a leucemic malignant lymphoma, however, despite failure after failure on the part of the surgeon to afford anything but the briefest possible relief to deformity, case after case continues to be operated upon before any sufficient trial of medicinal treatment has been made. Finally, the discouraged patient returns to his

physician with equal, if not greater, deformity than before from the enlarged glands. Despite the limited value of the arsenical treatment of this disease, it is likely to be advised after the operation and if of value then, as it sometimes is, although perhaps temporarily, it is likely to have been equally useful before operative treatment was undertaken. Despite such experiences, operations are so frequent upon this class of patients that it would seem as if ignorance of the progress of this disease prevailed, that its nature was unrecognized or that the patient had not been fully informed of the inevitable outcome.

The illustrations here presented are but a few drawn from the border-land of medicine and surgery, and it is unnecessary and perhaps undesirable to extend them indefinitely. They are not intended to oppose the surgeon in his persistent efforts to relieve suffering humanity, but to emphasize the importance of the careful study and selection of suitable cases. It is not to be expected that the practice of the healing art is to be based solely on hygiene and surgery, the former to prevent, the latter to relieve or cure disease, although this assertion so frequently has been the shibboleth of the last quarter of a century. The value of remedies in common use is sufficiently well established to permit their limitation to be recognized, and progress in the future is likely to depend much more upon the discoveries which shall make surgery less necessary than to open new fields for surgical treatment. Fully recognizing the marvellous benefits to humanity which anæsthesia and asepsis have brought about, it must be admitted also that these benefits are not wholly unalloyed. Operations are undertaken which are followed by the immediate death of the patient, others prove to be wholly unnecessary, and still others leave the patient in a condition of helpless invalidism, often making life worse than death. Any operation which does not

better the condition of the patient must be regarded as a therapeutic error, since the knowledge thus obtained shows that the operation should not have been performed.

The advance of knowledge in the future should be in the direction of limiting these unnecessary and harmful operations, for the wisdom of the surgeon should serve as well to restrain him from operating as to enable him to operate successfully. Especially to be cultivated for these purposes are greater accuracy in diagnosis and prognosis, and the more wide-spread knowledge of pathology and pathological anatomy. The surgeon thus will become a better adviser, although the number and variety of his operations thereby may materially be lessened.

PAPERS READ AT THE STATED MEETINGS OF THE ACADEMY.

1896.

JANUARY 2d.—"Infantile intussusception. A study of one hundred and three cases treated either by intestinal distension or laparotomy." Frederic Holme Wiggin, M.D.

JANUARY 16th.—"The bacteriology of empyema in children." Henry Koplik, M.D.

"The diagnosis and peculiarities of pyothorax in children." August Caillé, M.D.

"The treatment of empyema in children." Joseph E. Winters, M.D.

FEBRUARY 6th.—"Subphrenic abscess." Carl Beck, M.D.

"The deformity of hip disease illustrated by automatic models." A. B. Judson, M.D.

FEBRUARY 20th.—"The recent progress of treatment in affections of the upper respiratory tract."

(*a*) Nose and accessory sinuses. F. H. Bosworth, M.D.

(*b*) Pharynx: Naso-pharynx, oro-pharynx, laryngo-pharynx. J. E. Newcomb, M.D.

(*c*) Larynx and trachea. D. B. Delavan, M.D.

MARCH 5th.—"Broncho-pneumonia as a complication of diphtheria in children." Henry W. Berg, M.D.

MARCH 19th.—"Surgical treatment of hare-lip and cleft palate in children." D. H. Goodwillie, M.D.

APRIL 16th.—"Scleroderma." F. X. Dercum, M.D. (Philadelphia).

MAY 7th.—"Polyarthritis of scarlet fever." Henry W. Berg, M.D.

MAY 21st.—"Statistics of diphtheria." C. G. Coakley, M.D.

"Clinical observations on the antitoxin treatment of diphtheria and a report of personal investigation of this treat-

ment in the principal fever hospitals of Europe during the summer of 1895." Joseph E. Winters, M.D.

"Experiences with the antitoxin treatment." P. H. Ernst, M.D.

"Diphtheria with or without antitoxin." W. L. Stowell, M.D.

OCTOBER 1st.—"Practical points regarding the senile insanities, with special reference to prophylaxis and management." Ralph L. Parsons, M.D.

OCTOBER 15th.—"The effects of intrinsic poisons on the eye." J. H. Clairborne, M.D.

"Infectious diseases of the eye." C. J. Kipp, M.D.

"The visual disturbances due to nervous diseases." Ward A. Holden, M.D.

NOVEMBER 5th.—"The physical and Schott treatment of chronic heart disease." H. Newton Heineman, M.D.

DECEMBER 3d.—"The management of pneumonia patients." S. Baruch, M.D.

DECEMBER 17th.—"The essential nature of croupous pneumonia." Andrew H. Smith, M.D.

"The permanganate treatment of opium poisoning." William Ovid Moore, M.D.

1897.

JANUARY 7th.—"Prevention of the spread of contagious diseases." H. D. Chapin, M.D.

JANUARY 21st.—"A further study of tubercular infection of dust." Irwin H. Hance, M.D.

"The hygienic, educational, and symptomatic treatment of pulmonary tuberculosis, with a plea for sanatoriums for the poor." S. A. Knopf, M.D.

"Preparation of blood for microscopical examination." Henry G. Piffard, M.D.

FEBRUARY 18th.—"The use of modified milk in health and disease." Thomas M. Rotch, M.D. (Boston).

MARCH 4th.—"The Health Department of Greater New York." Stephen Smith, M.D.

MARCH 18th.—"Experimental and pathological observations on the uræmic intoxications." C. A. Herter, M.D.

APRIL 1st.—"The relations of diseases of the skin to general conditions." L. Duncan Bulkley, M.D.

APRIL 15th.—"Gall stones, their effects and diagnosis." George L. Peabody, M.D.
"The chemistry of gall stones." Professor R. H. Chittenden.
"The therapy of gall stones." W. G. Thompson, M.D.
"Surgery of the gall bladder." A. G. Gerster, M.D.
"Surgery of the common bile duct." F. Lange, M.D.

MAY 6th.—"Sun-stroke." Alexander Lambert, M.D.

MAY 20th.—"Report of 805 cases of sun-stroke occurring in New York in 1896, with a statement of the results of treatment, and a discussion of the pathology of the disease." Alexander Lambert, M.D.

JUNE 3d.—"Persistent tachycardia with digestive and nervous disorders." Wm. H. Thomson, M.D.

OCTOBER 7th.—"Treatment of puerperal septic diseases."
Medical Treatment. C. J. Jewett, M.D.
Surgical Treatment. E. H. Grandin, M.D.

NOVEMBER 4th.—"The sterilization of urethral instruments." Edward Martin, M.D. (Philadelphia).

DECEMBER 2d.—"Suppurative otitis media, its complications and treatment." Gorham Bacon, M.D.

DECEMBER 16th.—"The treatment of chronic empyema." B. Farquhar Curtis, M.D.

1898.

JANUARY 4th.—"The influence of diabetes in the parent on the transmission of mental disorders to offspring." Edward C. Spitzka, M.D.

FEBRUARY 3d.—"Intestinal hydrotherapy." R. C. Kemp, M.D.

FEBRUARY 17th.—"Non-tubercular inflammations of the spine." T. Halsted Myers, M.D.

MARCH 3d.—"Intubation in affections of the larynx."
Intubation in diphtheria. W. K. Simpson, M.D.
Intubation for chronic stenosis. D. Bryson Delavan, M.D.
Intubation for acute stenosis. Chas. H. Knight, M.D.

MARCH 17th.—"The ultimate results of thyroid treatment in sporadic cretinism." Henry Koplik, M.D.

APRIL 7th.—"Uterine fibroids."
Pathology. George C. Freeborn, M.D.
Pregnancy and fibroid tumors. Henry C. Coe, M.D.
Surgical treatment. W. M. Polk, M.D.

APRIL 21st.—"The state of the vaso-motors in acute lobar pneumonia." Richard Van Santvoord, M.D.

MAY 6th.—"On the use of climate for the tuberculous." S. E. Solly, M.D. (Colorado Springs).

MAY 19th.—"The serum exanthemata observed in the antitoxin treatment of diphtheria." Henry W. Berg, M.D.

JUNE 2d.—"The successful treatment of hemophilia by the injection of serum." Albert Fry, M.D. (Newark).

OCTOBER 6th.—"Surgery in the recent war." W. D. Bell, M.D.

NOVEMBER 3d.—"The radical treatment of hypertrophy of the prostate." Eugene Fuller, M.D.
"Personal experience with Bottini's operation for the radical treatment of hypertrophy of the prostate." Willy Meyer, M.D.

DECEMBER 1st.—"On certain functional (chiefly hysterical) conditions of the eye." B. Sachs, M.D.

DECEMBER 15th.—"Observations upon the pathological anatomy of chronic enlargement of the prostate, with special reference to the causes of muscular insufficiency of the bladder." Samuel Alexander, M.D.

1899.

JANUARY 19th.—"Inhibition." Samuel J. Meltzer, M.D.

FEBRUARY 2d.—"The U. S. Army ration and its adaptability for use in tropical climates." Louis Livingston Seaman, M.D.

FEBRUARY 18th.—"The serum treatment and its results." Herman M. Biggs, M.D.

MARCH 2d.—"Treatment of syphilis in its early stages." R. W. Taylor, M.D.
The same. L. Bolton Bangs, M.D.
"Differential diagnosis of syphilitic eruptions and signs in the skin of former syphilis." George H. Fox, M.D.
"Stigmata of syphilis in children." R. H. M. Dawbarn, M.D.

MARCH 9th.—"Syphilitic affections of the heart and lungs." Leonard Weber, M.D.

"Syphilitic affections of the liver in children and adults." J. George Adami, M.D. (Montreal).

MARCH 16th.—"Some surgical aspects of syphilis." Frank Hartley, M.D.

"Syphilitic dementia and paretic dementia and treatment of syphilis of the nervous system." C. K. Mills, M.D. (Philadelphia).

"The general diagnosis of brain and spinal cord syphilis." B. Sachs, M.D.

"Ophthalmological aspects of syphilis." C. S. Bull, M.D.

"Syphilitic affections of the respiratory passages." Francke H. Bosworth, M.D.

APRIL 6th.—"Researches on the etiology of the Texas cattle fever and its bearing on malaria." Prof. Theobald Smith (Harvard).

"Present status of the inoculation theory of malaria." Walter B. James, M.D.

"African Black Water fever." F. P. Lynch, M.D.

APRIL 20th.—"Malarial nephritis." W. S. Thayer, M.D. (Johns Hopkins).

"Some of the less common effects of malaria, with remarks upon the treatment of chronic infection." Wm. H. Thomson, M.D.

MAY 4th.—"Anæmia as observed in gynecological practice, with some practical suggestions as to diagnosis and treatment." W. Gill Wylie, M.D.

"The present status of our knowledge of chlorosis." Thomas S. Southworth, M.D.

MAY 18th.—"Recent methods of local anæsthesia for minor and for major surgical operations." Alexander B. Johnson, M.D.

"Further experimental researches on the effects of different anæsthetics upon the kidneys." R. C. Kemp, M.D.

"Technique of administration of anæsthetics." Thomas L. Bennett, M.D.

JUNE 1st.—"Treatment of summer diarrhœa in infants." Henry D. Chapin, M.D.

OCTOBER 5th.—"Certain aspects of bone and joint diseases

of interest to the general practitioner." Virgil P. Gibney, M.D.

OCTOBER 19th.—"Locomotor ataxia." C. L. Dana, M.D.

NOVEMBER 2d.—"The pathology of lobar pneumonia as a basis for treatment." Andrew H. Smith, M.D.

DECEMBER 21st.—"The clinical uses of the sphygmograph." Richard Van Santvoord, M.D.

1900.

JANUARY 4th.—"Pathology of migraine." Colman W. Cutler, M.D.

"Significance of migraine in Graves's disease." W. H. Thomson, M.D.

JANUARY 18th.—"Myocarditis." John H. Musser, M.D. (Philadelphia).

"Myocarditis in infants and children." Henry Koplik, M.D.

FEBRUARY 1st.—"Causes of failure of compensation." Morris Manges, M.D.

"Aortic valvulitis and aortitis." Frank W. Jackson, M.D.

"Recent methods of treatment by baths and exercises." Thomas E. Satterthwaite, M.D.

FEBRUARY 15th.—"Report by Drs. Roswell Park and Gaylord upon their researches on the etiology of cancer at the State Laboratory, Buffalo, N. Y."

MARCH 1st.—"Cancer of the larynx." D. Bryson Delavan, M.D.

"Cancer of the gastro-intestinal tract. Diagnosis and treatment." B. Farquhar Curtis, M.D.

"Treatment of inoperable cancerous tumors." William B. Coley, M.D.

MARCH 15th.—"Cancer of the breast." Robert Abbe, M.D.

"Cancer of the uterus." Henry C. Coe, M.D.

APRIL 5th.—"Prevention, management, and early diagnosis of scarlet fever." Floyd M. Crandall, M.D.

"The treatment of scarlatinal nephritis." R. C. Kemp, M.D.

APRIL 19th.—"Physiology of internal secretions." Prof. W. H. Howell (Johns Hopkins).

"The physiological effects of extracts of ductless glands." Richard H. Cunningham, M.D.

MAY 3d.—"Remarks on hyperchloridia and a report on the occurrence of mould in the stomach." Max Einhorn, M.D.

MAY 17th.—"Poisonous snakes and snake poison with demonstrations." Gustav Langmann, M.D.

JUNE 7th.—"Pathology of insolation." Ira Van Gieson, M.D.

OCTOBER 4th.—"Artificial infant feeding. Complete report written for the Children's Section of the Thirteenth Medical Congress." Abraham Jacobi, M.D.

OCTOBER 18th.—"Advantages and limitations of sterilizing and Pasteurizing milk." A. D. Blackader, M.D. (Montreal).

"Relations of scurvy to recent methods of artificial feeding." J. P. Crozer-Griffith, M.D. (Philadelphia).

"Concerning the use of cereals concerning emulsions and proteids." T. M. Rotch, M.D. (Boston).

"General principles of artificial feeding; home modification of milk." L. Emmett Holt, M.D.

"Feeding of infants upon milk, modified according to prescription in laboratories." W. P. Northrup, M.D.

DECEMBER 20th.—"Remarks on enteroptosis." Max Einhorn, M.D.

1901.

JANUARY 17th.—"On the value of the X-ray."

(*a*) In medicine. Francis H. Williams, M.D. (Boston).

(*b*) In surgery. Robert Abbe, M.D.

(*c*) In the detection and exclusion of renal and ureteral calculi. Charles L. Leonard (Philadelphia).

"The technique and correct interpretation of radiographs." W. E. Caldwell, M.D.

FEBRUARY 7th.—"Conservative operations on the uterine appendages."

(*a*) Their technique. J. Riddle Goffe, M.D.

(*b*) The significance and importance of such conservative operations. W. M. Polk, M.D.

(*c*) The immediate and remote results in one hundred cases. W. L. Burrage, M.D. (Boston).

(*d*) An experience in one hundred and sixty-three similar cases. A. P. Dudley, M.D.

FEBRUARY 21st.—"On the rôle of the colon bacillus in human affections." A. Lartigau, M.D.

MARCH 7th.—Discussion on alcohol and alcoholism: "Alcohol as a food." Professor R. H. Chittenden (Yale).

MARCH 21st.—"On the modern treatment of gonorrhœa and its complications and sequelæ."

(*a*) On acute gonorrhœa. G. K. Swinburne, M.D.
(*b*) On chronic gonorrhœa. John Van der Poel, M.D.
(*c*) On the complications of the anterior urethra. M. J. Echeverria, M.D.
(*d*) On the complications of the posterior urethra. J. Pedersen, M.D.
(*e*) On gonorrhœal conjunctivitis. W. A. Holden, M.D.
(*f*) On gonorrhœal stricture of the urethra. J. R. Hayden, M.D.

APRIL 4th.—"The duty of the public to the medical profession." (1) D. B. St. John Roosa, M.D.; (2) W. H. Thomson, M.D.

MAY 2d.—"On the clinical aspects of acute intestinal obstruction." Howard Lilienthal, M.D.

MAY 16th.—"On sitophobia of enteric origin and on syphilis of the liver." Max Einhorn, M.D.

"On the intestinal intoxication occurring in mucous colitis in young children." Henry Koplik, M.D.

JUNE 6th.—"The freezing point of urine; its determination and the inferences which may be drawn from it." J. H. Huddleston, M.D.

"The early recognition and management of arterial degeneration." L. F. Bishop, M.D.

OCTOBER 17th.—"A clinical discourse on the gift of Helmholtz to the medical profession by the invention of the ophthalmoscope fifty years ago." Herman Knapp, M.D.

NOVEMBER 1st.—"The etiology of cystitis." W. K. Otis, M.D.

NOVEMBER 7th.—"The causation of multiple neuritis." M. Allen Starr, M.D.

NOVEMBER 21st.—"Some remarks on the diagnosis of cirrhosis of the liver." James C. Wilson, M.D. (Philadelphia).

"The operative treatment of ascites in cirrhosis of the liver." G. E. Brewer, M.D.

DECEMBER 19th.—"Remarks on British Congress of Tuberculosis and the prevention of tuberculosis." E. G. Janeway, M.D.

Symposium. (*a*) Difference between bovine and human tuberculosis. Theobald Smith, H. M. Biggs, and W. H. Park.

(*b*) Origination of tuberculosis from cow's milk. A. Jacobi, W. H. Northrup, J. E. Winters, and D. Bovaird.

(*c*) Need of sanatoria for tuberculosis. G. L. Peabody, S. A. Knopf, Alfred Meyer, H. P. Loomis, J. E. Stubbert, and L. Weber.